October, 1956

Vol. 45
No. 8

Industrial Arts and Vocational Education

SHOP PROJECTS NUMBER

The Shop Teachers' Professional Magazine

PHOTOGRAPH COURTESY OF
POPULAR SCIENCE MONTHLY

. . . and it's only the beginning

DURING the International Geophysical Year the United States will launch the first man-made moonlet. This first satellite will spin about the earth once every hour and a half in an elliptical orbit passing within 200 miles of the earth's crust at the nearest point and soaring 800 miles from the earth at its farthest point. Physically, the satellite will be spherical in shape measuring 30" in diameter and weighing 21.5 pounds. Packed with precision instruments, this first moonlet will be man's pilotless pioneer in the wilderness of outer space. And this is only the beginning. Surely more satellites will follow the first and finally man's first flight into space. But in the annals of history the first moonlet will take its rightful place . . . the beginning from which all else was born.

Man's first satellite is to the conquest of space as the foundation is to any structure or as a lad's education is to his adulthood. To the instructor of mechanical drawing, he sees his students standing on the threshold of an engineering career. With tireless energy he imparts to the student the love of fine work, a devotion to skilled craftsmanship, and habits of creative thinking and sound judgment. It is axiomatic that drawing instruments are basic tools of the engineering profession. Here worthy instructors insist each student obtain the finest drawing set the student can afford. Shoddy, cheap drawing tools in the hands of the student are certain to stain his respect for his chosen profession. Precision drawing instruments are a lifetime possession . . . precision will inspire precision.

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SPECIAL OFFER TO SHOP INSTRUCTORS—34 graded projects each complete with drawings, bill of materials, step-by-step instructions. 104 pages, $2.00. Sample project book and companion book "How To Run A Lathe" (value $2.50) sent for only $1.00.

Lo-Loss spindle drive and precision quill.

Large, adjustable graduated collars.

Power table feed and quill feed optional.

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Spindle to column (max.)	20"
Spindle speeds (8)	135 to 3750 r.p.m.
Spindle travel	4"
Head rotation	360°

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Toolmaster

What are your standards for vocational shop equipment? Whatever they are, you will find that the new CINCINNATI Toolmaster Milling Machines measure up to all your requirements. They are built to the highest industrial standards of quality and cutting capacity, yet they are priced within most school budgets. Toolmaster Milling Machines are safe and easy to operate and maintenance is next to zero. They are designed to meet tool and die shop demands for versatility, and for this very reason, your students will become familiar with a variety of milling setups.

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Would you like more information? Write for new four-color catalog No. M-1870-2.

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CINCINNATI 9, OHIO

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CINCINNATI TOOLMASTER
MILLING MACHINE

Built in three styles:

	Range:
1A—Manual feed to quill, 1 hp motor	16" table traverse
1B—Power feed to quill, 1 hp motor	10" cross
1C—Heavy duty head, 2 hp motor	17" vertical

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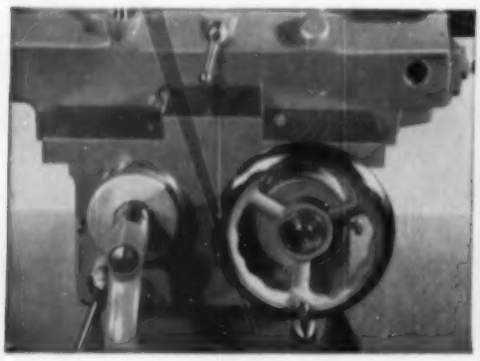
Extra Wide Knee

Has two advantages: wide square gibbed bearing ways for maximum strength; narrow guide for smooth cross adjustment.



Shaping Attachment

The ruggedly constructed Shaping Attachment greatly increases the variety of work which can be handled on the Toolmaster Milling Machine.

Oil-Shot Lubrication

Saddle-table parts and way bearing surfaces are lubricated from centralized oil-shot system.

OCTOBER
1956

VOL. 45 NO. 8

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine

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☆ ☆ ☆

This Month's Cover

This month's cover picture shows two of the storage cabinets at the science laboratory at Murrell Dobbins Vocational-Technical School, Philadelphia, Pa.

Photograph was sent to us by Benjamin J. Novak, formerly an instructor at Murrell Dobbins Vocational-Technical School, and now vice-principal at Frankford High School, Philadelphia.

☆ ☆ ☆

Your 1956–1957 Address

May we remind you once more that you will probably lose one or more issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION unless we have your correct address.

Please send us your new address at once, together with your former address. Please include zone number.

☆ ☆ ☆

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Association News

COMING CONVENTIONS

Oct. 5–6. Ohio Vocational Association, at Youth Center Ohio State Fairgrounds, Columbus, Ohio. Secretary, Ralph J. Woodin, 101 Rehearsal Hall, Ohio State University, Columbus, Ohio.

Oct. 20–26. National Safety Council, at Morrison Hotel, Chicago, Ill. Director, Wayne P. Hughes, 425 N. Michigan St., Chicago 11, Ill.

Oct. 25–26. Minneapolis Vocational Association, at Leamington Hotel, Minneapolis, Minn. Secretary, Constance Malmsten, Technical High School, St. Cloud, Minn.

Nov. 1–2. Iowa Vocational Association, at Hotel Savery, Des Moines, Iowa. Secretary, M. Z. Hendron, State Office Building, Des Moines, Iowa.

Nov. 1–2. Wisconsin Industrial Arts Association, at Public Museum Auditorium, Milwaukee, Wisconsin. Secretary, Leo R. Ebben, 519 Church St., Kohler, Wis.

Nov. 7–9. Missouri Vocational Association, at Municipal Auditorium, Kansas City, Mo. Secretary, H. H. London, University of Missouri, Columbia, Mo.

Nov. 10–12. Adult Education of the U.S.A., at Chalfonte-Haddon Hall Hotel, Atlantic City, N. J. Malcolm S. Knowles, 743 North Wabash, Chicago, Ill.

SHELDON *Builder of Sheldon Lathes, Milling Machines, Shapers and Sebastian Lathes*

It only takes one good Milling Machine and a capable Shaper to triple the value of your shop course

No course in shop practice can be complete without basic instruction on the milling machine and the shaper.

For this no other units equal the size "0" Sheldon Milling Machine with its hand and power table feed, quick-change gear box, variable speed drive, back geared unit, and interchangeable vertical milling head attachment. No other shaper is better suited for class work than the ample size Sheldon 12" Back Geared Shaper with its large capacity, long stroke, variable speed drive, weight and accuracy.

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Sheldon provides today's modern school shop with "up-to-date" machine tools . . . with 10", 11", and 13" Precision lathes for both industrial arts and vocational programs . . . Sheldon Milling Machines . . . Sheldon Shapers . . . and, for advanced courses, Sebastian 13" and 15" Geared Head Lathes.

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Write for samples today——

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INDUSTRIAL ARTS PROJECT FAIR

The sixth annual North Carolina Industrial Arts Project Fair was held at Lindley Junior High School, Greensboro, N. C., May 11 and 12, 1956. Over six hundred projects from all parts of the state were registered. A total of 104 instructors and/or teacher trainers were present.

Six cups and over eighty medals were presented to the winners of the different divisions and classifications.

The most Outstanding Achievement Award was granted to Henry Ball of Curry Training School, Woman's College, Greensboro, for his large mahogany secretary. David Rigsby, instructor, also was presented with a cup. Mr. Rigsby is the immediate past president of the Association.

Officers elected for the coming year are: president — Robert Leith of Myers Park High School, Charlotte; vice-president — Tom Shore, Lexington High School; secretary-treasurer — Dr. Marshall Schmitt of State College, Raleigh; executive committeeman — Jess Dills, Piedmont Junior High School, Charlotte.

Eleven teachers from Charlotte became Life Members, and 22 exhibitors displayed their equipment and supplies. — *K. C. Sinclair,* chairman, public relations.

NEA CENTENNIAL IN 1957

The National Education Association, with its 650,000 members in 6000 local associations, 30 departments, 21 commissions and committees and 13 headquarter divisions, will celebrate its centennial anniversary throughout 1957. It has accordingly set up a special commission of 21 lay and professional leaders who have established a theme and objectives and defined general policies for the program. The theme is "An Educated People Moves Freedom Forward."

The administrative responsibility for the program is centered in the Centennial Office at the NEA, which operates under the counsel of a staff committee and is to coordinate some 28 staff and field committees assigned various centennial projects.

The program is to respect the fact that the NEA and the schools it serves have made a century of history in every nook and cranny of the nation and that the celebration should, therefore, take place everywhere. It is to permit full exercise of local ingenuity and resourcefulness, the centennial office and project committees making suggestions and offering help but laying down few exact patterns for the celebration.

Among the special events to mark the hundredth year are the centennial birthday party, set for Thursday, April 4, 1957, meant to bring together in every community, city, and town those who work for our schools, both in and out of the teaching profession, to celebrate what they, and those who have gone before them, have been building together; and the centennial convention, June 30–July 6, in Philadelphia, birthplace of the NEA, with special tours to the convention for teachers and with a special centennial festival to be produced by the Philadelphia public schools.

Other events to highlight the centennial year will be made known when plans are completed.

FOURTEENTH FOUR-STATE CONFERENCE

The fourteenth annual four-state Industrial Arts and Vocational Education Conference

(Continued on page 6A)

New B&D HEAVY-DUTY Impact Wrench simplifies automotive training!

So rugged we dare offer a year's FREE SERVICE certificate!

There are three good reasons for training your students with the most modern tool of its kind—the new Black & Decker Heavy-Duty Impact Wrench. First, its easy handling cuts learning time. Second, it's the tool they'll be using in shops after graduation. Third, it's rugged—our special free service certificate is proof of that.

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No other manufacturer DARES MAKE THIS SPECIAL OFFER!

Every B&D Impact Wrench is covered for *one full year* by a *free* service certificate. It protects you against *all* maintenance costs resulting from normal use!

★ **It costs less to maintain... lasts longer...runs cooler!**

Packed with Advanced Features!

1. **Positive-Action Reversing Ring protected from accidental operation by stationary end cap.**
2. **Absorbs Shock—patented armature construction.**
3. **Reduced Operator Fatigue—pistol grip handle and perfect balance provide maximum comfort.**
4. **Lower Maintenance Costs—all mechanical parts are ruggedly constructed for longer service life.**
5. **Plus Twice The Airflow of Comparable Tools. Can't Stall or Overload. Uniform Output. Rated above 120 Ft. Lbs. Torque.**

Look in the Yellow Pages under "Tools — Electric" for Nearest Distributor.

B&D Black & Decker®

Portable electric tools . . . *power-built* to last!

ASSOCIATION NEWS

(Continued from page 4A)

will be held at the Kansas State Teachers College, Pittsburg, on October 12 and 13, 1956.

Dr. Seymour L. Wolfbein, Chief, Division of Manpower and Employment Statistics, U. S. Department of Labor, Washington, D. C.; and Dr. Randall T. Klemme, Director, State Department of Commerce and Industry, Oklahoma City, Okla., will be the featured speakers.

The theme of the conference is "Education and the Effective Utilization of Manpower."

A good program of sectional meetings and exhibits has been arranged for this fourteenth annual get-together, and all interested persons are cordially invited to attend. — *J. V. Melton*, secretary.

THE NATIONAL SAFETY CONGRESS

The National Safety Council, 425 North Michigan Ave., Chicago 11, Ill., announces its 44th National Safety Congress to be held on October 22 to 26, 1956, in Chicago.

The 1956 Congress will feature more than 800 program participants speaking at 200 sessions on all types of accident prevention — industrial, traffic, home, farm, and school. In the industrial field alone, 27 complete programs will be sponsored by the industrial sections of the National Safety Council.

Back in 1912, when the first National Safety Congress got underway, there was only a handful of safety men present, and one room of the Hotel Pfister in Milwaukee was more than adequate for that first convention of the organized safety movement. Today's safety Congress will take all the meeting space in five of Chicago's largest hotels.

The Congress headquarters will be in the Conrad Hilton Hotel. — *Jack Horner*, Director of News.

Stretch your school-shop budget with the DYNO-MITE POWER WORKSHOP

No. 889 6" BENCH SANDER
No. 883 6¼" BENCH SAW
No. 881 BENCH STAND
No. 8810 4" BENCH GRINDER
No. 8815 7-to-1 SPEED REDUCER
No. 888 POWER UNIT
complete with ½" Jacobs Geared Key Chuck, 6" rubber pad, three 6" sanding discs, 6" polishing bonnet, wheel arbor, and reversible side handle
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No. 886 PORTABLE JIG SAW
No. 882 ORBITAL SANDER
No. 8814 DRILL PRESS STAND
No. 887 JIG SAW TABLE
No. 8816 DRILL PRESS VISE

. . . made up of the rugged ⅓ h. p. DYNO-MITE 888 Power Unit and matched attachments!

Here's an easy, practical way to make your budget dollars do double duty

Now at amazingly low cost, you can give your students a wide variety of powerful, efficient electric tools capable of accurate work on all kinds of projects.

Basically, you start with the rugged, versatile 1/3 h. p., 4.0 amp. No. 888 Power Unit. Cost: only $44.95 fully equipped as *3-tools-in-1:* a 3/8" Drill, a 6" Sander, and a 6" Polisher.

Then, to fit the particular requirements of your shop, you can buy exactly the quantities you want of the inexpensive, matched attachments shown above. Write today for full details:

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JUST OUT!
NO. 8818
PLANE ATTACHMENT

- 2" Cutter
- Depth of cut: 0" to ⅛"
- Angle adjustable through 130°

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SINCE 1868
The Mark of Superiority

Personal News

F. I. WALLACE RECEIVES DEGREE

Fay I. Wallace, state supervisor of trade and industrial education for Nevada, received his master's degree during the summer commencement ceremonies on August 10 at Colorado A. & M. College. It was handed to him by John Coleman, director of La Crosse Vocational and Adult School, La Crosse, Wis.

Fay I. Wallace receives degree from John Coleman

Mr. Wallace's career in the educational world was brought about through long years of association with Mr. Coleman. It was at his direction that Mr. Wallace, an expert auto mechanic without schooling beyond the eighth grade, became interested in continuing his education, and he coached him in required high school subjects to enable him to prepare himself to become a teacher at the La Crosse school. For some time Mr. Wallace conducted the auto-mechanics classes, and again turned student to attend summer sessions at Stout Institute and General Motors Institute in order to meet the state's certification of teachers. He earned his bachelor's degree from Colorado A. & M. College, and some of his courses were taught by his old friend, Coleman.

Mr. Wallace's career widened. In 1940 he moved to Ely, Nev., where he instigated a new trade and industrial education program for the White Plain County High School. Five years later he became chief of education and training of the Veterans' Administration at Reno. In 1951 he became state supervisor

(Continued on page 24A)

ROCKWELL-BUILT

DELTA 11" metal lathe

DRILL PRESSES:
17", 14"

CIRCULAR SAWS:
12", 10" Tilting Arbor;
10" Tilting Arbor Bench

JOINTERS:
8", 6" Long Bed

RADIAL SAWS:
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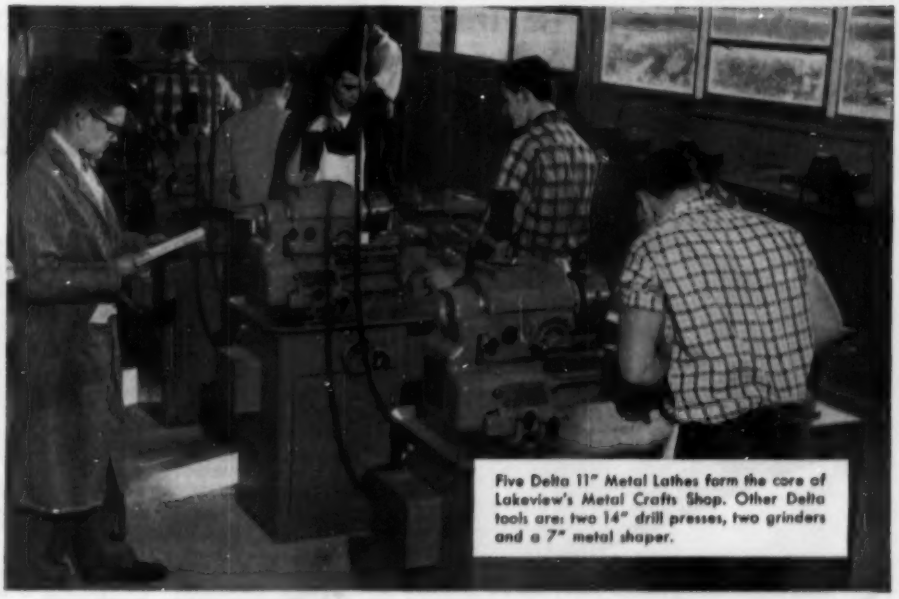
BAND SAWS:
14" Metal-Wood

DELTA . . . world's most complete power tool line 53 machines...246 models . . . over 1300 accessories.



Five Delta 11" Metal Lathes form the core of Lakeview's Metal Crafts Shop. Other Delta tools are: two 14" drill presses, two grinders and a 7" metal shaper.

. . . why the experts chose it over four other lathes for school shop instruction

at Lakeview High School. St. Clair Shores, Mich.

DECISION BASED ON COMPARISON—Close inspection of four other top competitive makes, plus years of accumulated experience and know-how, went into the selection of five Delta Metal Lathes for Lakeview Senior High School. M. A. Michael, Director of the Industrial Education Dept., and school board members whose work makes them thoroughly familiar with metalworking machines, chose Delta for safety, ease of operation and over-all cost savings.

REAL VALUE, SOUND FEATURES—Mr. Michael says, "A demonstration convinced us of the real value in the Delta lathe." He estimates that Delta's interchangeable taper attachment alone saved $1000 in initial cost. "I also like Delta because you don't have to spend the time it takes to make repairs and adjustments on some other lathes," says Mr. Michael.

SEE THE ENTIRE DELTA 11" METAL LATHE LINE—And get all the facts about new Delta production accessories that convert your Delta engine lathe into an efficient production machine—at lowest cost. Compare—then make up your *own* mind! Your Delta Dealer is listed under "TOOLS" in the Yellow Pages of your phone book.

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- ☐ Information on new Delta Lathe Accessories.
- ☐ Fact book on using Delta Power Tools teamed with machine tools.
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School _____

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City _____ County _____ State _____

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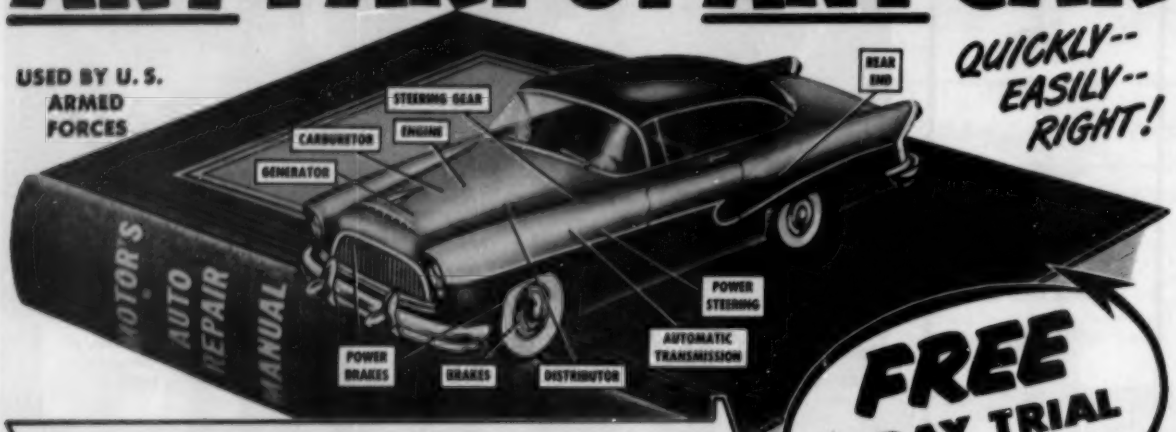
ANY PART OF ANY CAR



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That's why so many instructors keep at least one copy of MOTOR'S new Auto Repair Manual in the school shop. It shows, in clear step-by-step words and pictures, the latest procedures for handling any service or repair job on any make or model car built from 1946 through 1956. It tells where to start, what tools to use — then leads the student easily and quickly through the entire operation!

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FREE EDUCATIONAL AIDS

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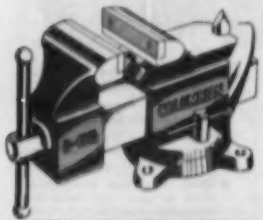

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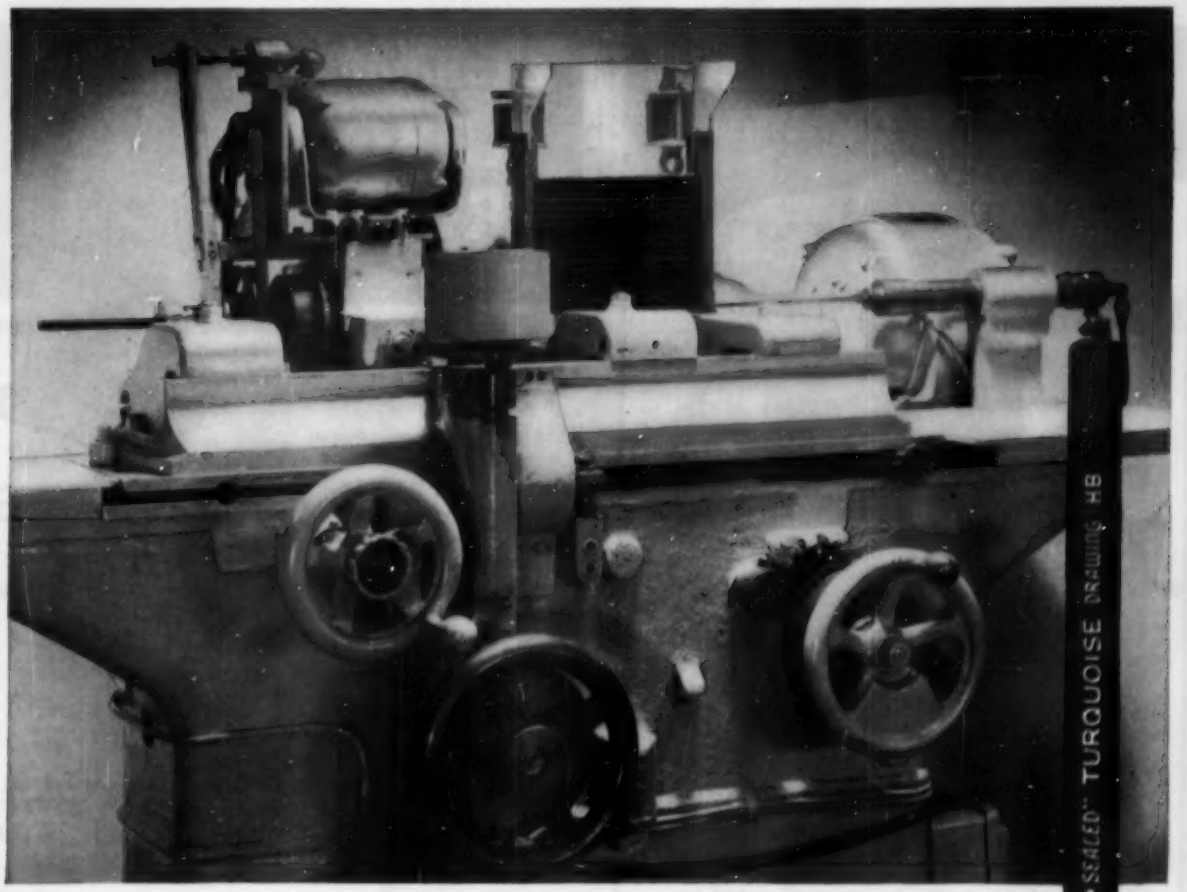

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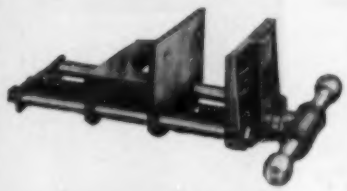

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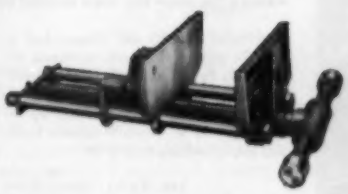

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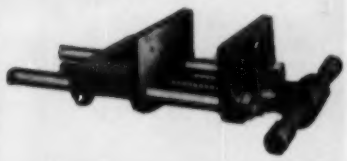

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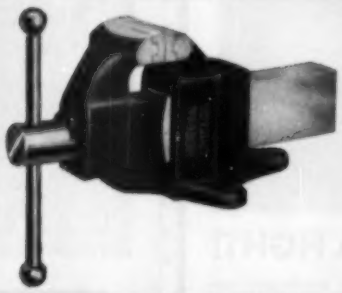

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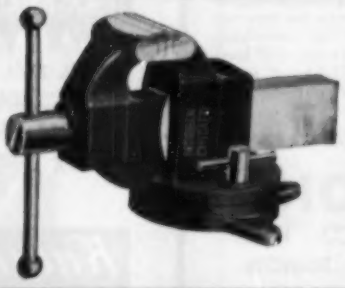

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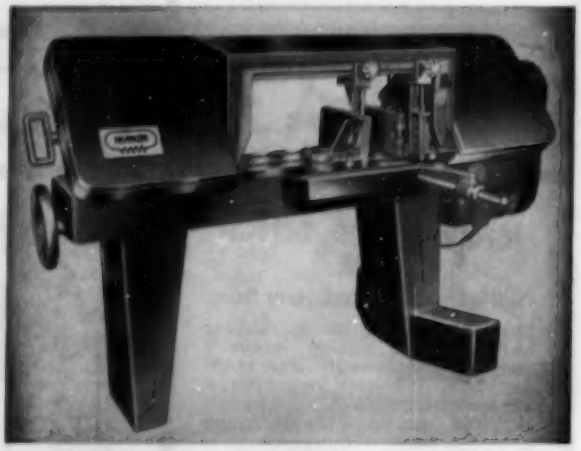

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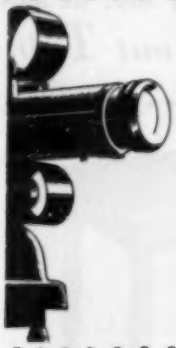

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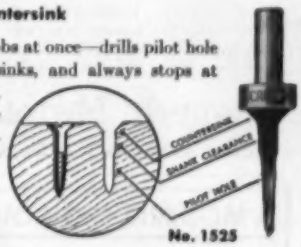

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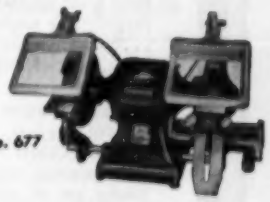

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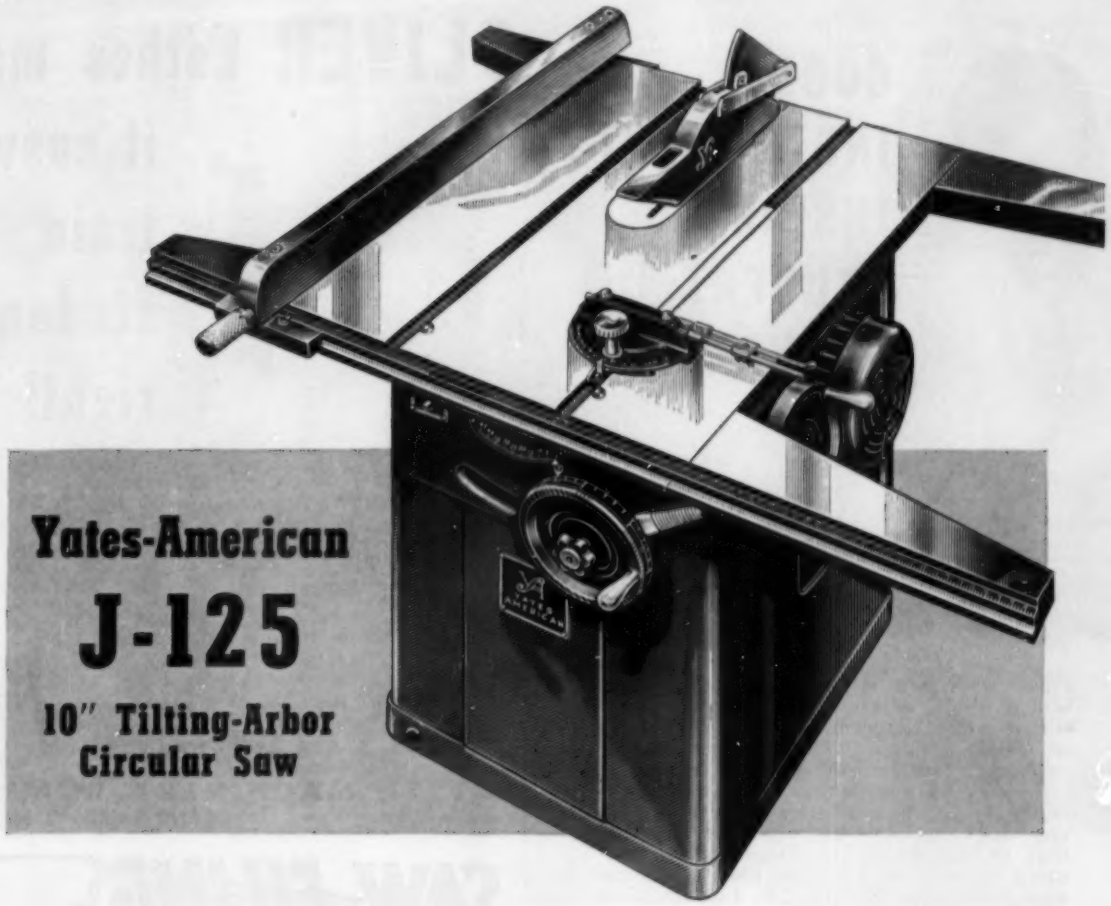

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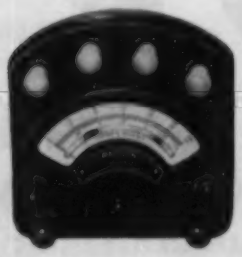

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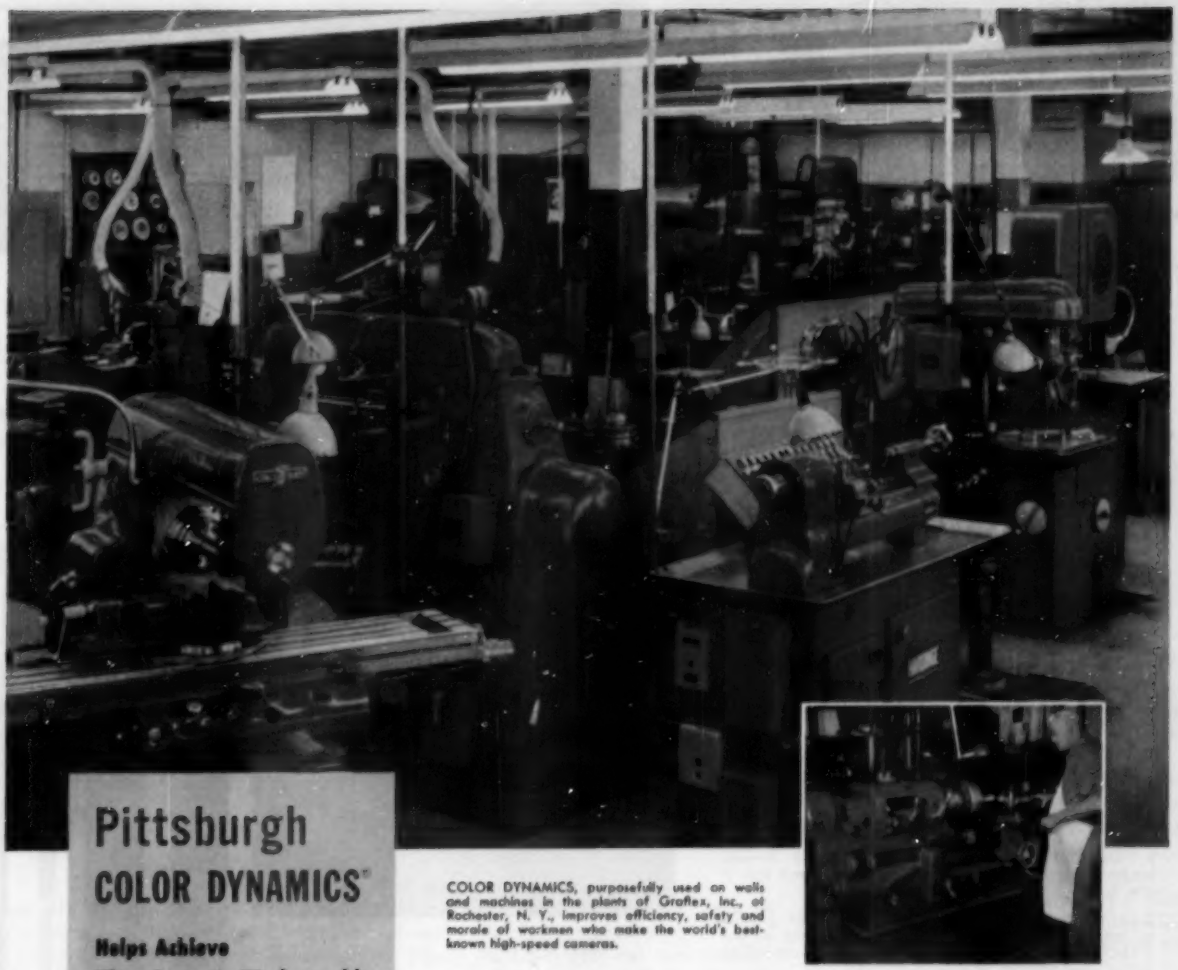

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HOW-TO project for the School Shop

—by NICHOLSON FILE COMPANY

NO. 19 OF A SERIES

ANTIQUE KEY PLATE

Material: 1/16" x 1 3/8" x 3 1/2" CRS

Tools: Square, scriber, ball peen hammer, surface gage, dividers, 8" rule, center punch, hack saw (32 pitch), 1/8" drill, 1/4" drill, Nicholson 8" Mill Bastard file, 6" Half Round Bastard file and an assorted set of Nicholson XF Round Handle Needle files— 6 1/4" length, No. 2 cut.

PROCEDURE

1. Remove all burs from edges with 8" Mill file; file one edge straight and square.

2. Paint surface with layout dope.

3. Using square and scriber, scribe line A through approximate center of stock.

4. Scribe two lines 1/2" above and below line A.

5. Using surface gage, scribe center line B through length of stock; also lines C and D 1/8" on each side of line B.

6. Set dividers to 1 1/4" and, with one leg of dividers on intersection of lines A and B, scribe a mark on line B above and below line A, and with square and scriber scribe lines parallel to A.

7. Set dividers to 3/8" and scribe arcs 1, 2, 3, 4, 5 and 6.

8. Set dividers to 7/16" and scribe arcs a, b, c, d, e, f, g and h.

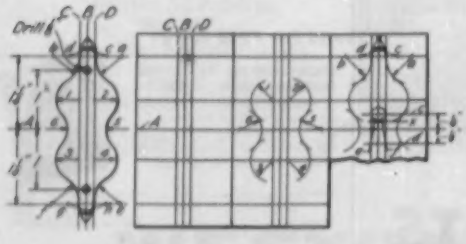
LAYING OUT THE KEYHOLE

9. Set dividers to 1/4". With one leg of dividers on intersection of lines A and B, mark off on line B points c and d and scribe lines.

10. Set dividers to scribe 1/4" circle with center at point C.

11. Scribe line X parallel to line A tangent to bottom of circle.

12. Mark off 1/16" on both sides of center line B on line X.



13. Scribe lines e, f to match drawing.

14. Lay off 1" on line B above and below line A. Center punch and drill with 1/8" drill. Caution: **hold the work in a drill vise.**

15. Saw to within 1/32" of line, using long, even strokes with a light pressure to avoid bending the work.

16. File out body of work with 6" Half Round Bastard file. File concave surfaces first and blend all radii with flat side of file, using long, even strokes, rolling the file with each stroke to obtain well-blended radii with an outline of smooth, interesting appearance.

FILING THE KEYHOLE

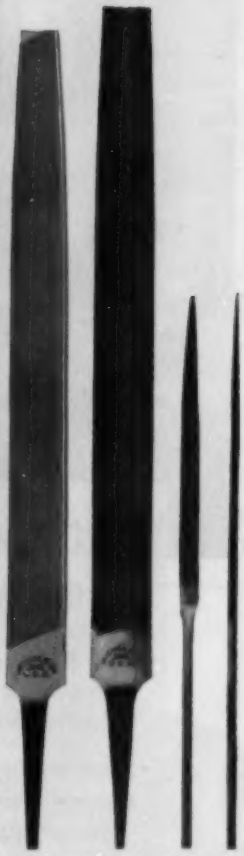
17. Drill hole at point C with a 1/4" drill. Remainder of keyhole is finish-shaped by using various shapes of files from assorted 6 1/4" Round Handle Needle files, No. 2 cut, filing to layout lines.

18. To give the hammered appearance, hold work on anvil or bench block and hit with ball peen end of hammer, also a few blows with the edge of the face of the hammer to suit the appearance of the piece.

COLORING THE PLATE

19. Heat work to deep blue or black and quench in water.

20. Place work on wooden block and hold with two brads in drilled holes. Draw-file with an 8" Mill Bastard file to give a bright appearance on the surface. Dip in lacquer and let dry.



The Nicholson Mill Bastard, Half Round Bastard and representative Round Handle Needle files are shown in sizes reduced from those specified in the text.

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Industrial Arts and Vocational Education
The Shop Teachers' Professional Magazine
OCTOBER 1956

Motivation, Problem Solving, Understanding —

Psychology of Learning and the Teaching of Industrial Arts

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One of the important contributions that study in the psychology of learning has made to the teaching of industrial arts is the increased emphasis given to the role of problem solving in learning. Some have gone so far as to say that problem solving and learning are synonymous. This paper will deal with three aspects involved in the teaching of problem solving as they relate to industrial arts: (1) How do we motivate problem solving? (2) What kinds of experiences can we provide to develop problem solving ability? (3) How do we provide meaningfulness and understanding through problem solving?

An analysis of the problem solving situation is helpful in developing these three aspects. Very simply we can define the problem solving situation as involving a learner on one hand striving toward a goal on the other hand. In his efforts to reach the goal he is blocked by some obstacle and finds no ready response to conquer it. Problem solving is involved in his efforts to bypass or penetrate the obstacle and reach the goal.

How Do We Motivate Problem Solving?

The key to motivation probably lies in a study of the goals toward which the learner strives. There are several important characteristics that should be possessed by the goals if they are to serve as effective motivators.

Goals must be clear-cut and concise. Recent work in the psychology of learning and literature in our field has placed great stress on the importance of well-defined goals. A concise means of defining objectives has evolved, a definition in terms of the behaviors expected of students. One of the most recent statements of objectives for our field is to be found in *A Guide to Improving Instruction in Industrial Arts.*[1] This bulletin, a revision of an earlier one, places increased emphasis on the careful specification of what we expect the student to know, do, and be as a result of our work.

Goals must be accepted by the learner. It must be admitted that the goals set by the school and the teacher are not always the goals accepted by the students. For example, the teacher may be concerned with a goal like "development of an appreciation of good workmanship," while the student may set the completion of a project as his goal. Effort on the part of the student to reach his goal may facilitate the achievement of the teacher's goal or it may actually interfere with it. The problem of the teacher is to show the student how closely their two sets of goals actually come. The heartening aspect for teachers is that practically all motives are learned.

Goals must be realistic. Goals may be clear-cut; they may even be accepted by the learner, at least initially, but if they are not achievable by him they will do little to stimulate problem solving. There has been a number of studies pointing to the importance of realism in goals. Their results have been similar to those found by Lockerette[2] in our field. He studied the effect of level of aspiration set by students attempting to plane a piece of wood to a given width. He found that it is possible to teach students to set realistic goals, and that those who did set realistic goals performed more nearly to their level of aspiration, were better satisfied with their results, and actually achieved higher levels than students who set unrealistic levels of aspiration. He further found that students who were taught to set goals, realistic or not, achieved better than those who set no goals at all.

Incentives, secondary goals, are often needed to encourage progress toward more remote and general goals. Early research in the psychology of learning that considering goals at all was usually concerned with incentives of some sort, often rather unrelated to the task to be learned. The literature abounds with studies of the effects of praise and reproof, long-range and short-range goals, knowledge of the results, marks, and so forth. The important generalization for us seems to be that the more closely

[1] *A Guide to Improving Instruction in Industrial Arts* (Washington, D. C.: American Vocational Association, 1954).

[2] Rutherford Lockerette, "The Effect of Level of Aspiration Upon the Learning of Skills," Unpublished Ed.D. Thesis, University of Illinois, 1955.

related the incentive is to the purposes of the learner the more effective it is in motivation. One of the common incentives that we employ is the project. Unless it is used carefully, it may actually hamper the development of such objectives as the development of cooperative attitudes and even the development of skill.

What Kinds of Activities and Experiences Can We Provide to Develop Problem Solving Ability?

It has often been said that the teacher cannot learn for the student. His primary function is to manipulate the learning environment so that opportunity is provided for the student to learn. Our job is to provide activities that will lead toward increased problem solving by the student. The psychology of learning long ago discarded the "training of the mind" concept, but there seems to be general agreement that certain tools, skills, knowledges, and attitudes, are necessary for problem solving. It cannot take place in a vacuum. Early attempts at *progressive* education at times seemed to forget this. The important consideration for us seems to be not whether such tools are needed but how the manner in which they are acquired influences their usefulness in problem solving. This will be recognized as the long-standing problem of transfer of learning.

There is still considerable disagreement at the theoretical level on just how transfer takes place, but there is a good deal of practical evidence to aid teachers in facilitating the transfer of the tools of problem solving to the solving of problems.

The closer the resemblance between the situation through which the skill, knowledge, or attitude was acquired and the situation in which it is to be used, the more useful it will be. If we wish to facilitate the student's attempts to interpret industry and industrial life, we will do well to teach him skills, knowledges, and attitudes in situations approaching those of industry. This is one of the main justifications for shops and laboratories in industrial arts even when the majority of our objectives deal with other than the development of technical skills as such.

There has been heightened attention very recently to the place of industry in industrial arts. The April, 1956, issue of *School Shop* was devoted entirely to this topic. A good deal of this attention is not aimed entirely or even primarily at training the specific skills of industry but rather at teaching skills, knowledges, and attitudes in such a way that they will be most useful in interpreting industry.

Transfer of skills, knowledges, and attitudes of problem solving is improved when the learner generalizes the principles, rules, and methods of attack. A number of experiments has demonstrated that teaching the elements of problem solving in such a manner that concepts and generalizations emerge greatly facilitates their use in problem solving. Illustrative is a study by Katona[3] in which the learning tasks were various card and match tricks. Some learners were taught to memorize the tricks and others to understand the principles involved. It was found that the group that was aided to understand the principles involved was the superior in solving the tricks not only immediately but after a period of four weeks. More important, the understanding group was much superior in solving new problems of a similar type.

There are many examples in industrial arts where this principle can be applied. For example, in beginning woodwork, we often teach students how to select the proper size drills for pilot and anchor holes in driving screws. We could train students to memorize the sizes for the common screws that they use; we could teach them how to use a chart to obtain the correct drill sizes; or we could acquaint them with the principle upon which the chart was devised. In this case the *understanding* method, the last one, would have the greatest value in unsupervised problem situations. In this case it is probably easier to teach also. It might be interesting to investigate the transfer of this principle to selecting the proper tap drill for machine screws in metalworking.

It is necessary to go further, of course, than just to develop skills, knowledges, and attitudes for problem solving. We must also provide active experience in solving problems. This is certainly not to imply that the elements are developed separately and then applied; the process is interrelated and continuous.

Early attempts at improving problem solving often centered around techniques. Dewey's *How We Think*[4] has been used as a model of a logical approach to problem solving. The field of arithmetic has always emphasized method in solving problems. Pupils are often trained to ask: (1) What am I given? (2) What am I to find? (3) What numbers will I use? (4) What is the probable answer? Research has shown that constant drill in stereotyped methods has done little to improve problem solving. In fact there is evidence in some cases that it actually hampers arriving at adequate solutions because of imposed mental sets which preclude consideration of other possible methods.

The most promising approach to developing problem solving ability, and there is a need for much experimentation at this point, seems to be to teach for understanding and to provide as many problem situations as possible, allowing the student to structure his own attack on them.

How Do We Provide Meaningfulness and Understanding?

Undoubtedly one of the greatest weaknesses in our educational system, and unfortunately a rather common one, is that which leads students to substitute memorization for meaningful learning. The importance of meaningfulness for problem solving was pointed out in the previous section. How can we enchance its development?

The enlargement of meaning is a developmental process. Meaningfulness has dimensions: concrete to abstract, vague to clear, and inexact to definite. It proceeds from a point in the learner's stage of development. It does little good in an initial demonstration to discuss all of the fine points involved. Their development will better come at a later stage. In opening discussion on a major generalization to be developed it may be necessary to outline only the major points and to tie them to material familiar to the learner. It may be necessary to oversimplify concepts at first. What may be regarded as *correct* at one stage of the development of a concept may later prove to be correct only with reservations. At early stages it may be well not even to verbalize concepts but allow that verbalization to emerge in later stages.

Meaningfulness is enlarged by an abundance of experiences differing somewhat but all related to the pattern under development. We do not invest a concept with broad meaning by repeating one illustration of its application over and over again. A varied attack from many sides is more valuable. There are many examples from our field to illustrate the point. Let us take a common skill activity, the squaring of stock in woodwork. In elementary work, six steps are often taught. They may be abbreviated as side, edge, end, end, edge, side. Students may memorize and follow them with very little understanding. If squaring problems that always call for this same procedure are used throughout the course the understanding gained could be very slight. Better understanding could be developed by varying the problem; one time the ends could be mitered and the squaring procedure altered accordingly; in another case one edge may be shaped irregularly; in still another situation the stock

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[3]George Katona, *Organizing and Memorizing* (New York: Columbia University Press, 1940).

[4]John Dewey, *How We Think* (Boston: D. C. Heath Co., 1910).

used may be presurfaced to thickness. The principles of squaring remain the same but a broader insight is provided in different applications.

The development of problem solving ability is often tedious and frustrating. It is hard work for the teacher and hard work for the learner. No royal road has been discovered. At various points the teacher may be tempted to drop the whole procedure and revert to the directed teaching of facts and skills — it often seems that that is what the students want. But the rewards for even a small increase in problem solving are great, and upon its development hinges the achievement of the objectives for our field.

A Canadian Viewpoint —

My Philosophy of Industrial Arts

LARRY DOBRANSKI
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Industrial arts, as a school subject, has undergone many changes since its inception to the present time, as a recognized integral part of our educational system. It has passed through several stages of growth and decline, not with little opposition, but the stronger the opposition the greater the growth. Instead of disappearing, it flourished on the seeds of discontent, and its popularity increased. This popularity, I believe, is due in part to its common appeal amongst leading educators, and above all to the common masses. It has something to offer, something which cannot be given, or perhaps cannot be given as well by the regular academic subjects. This appeal is directed to the very basic nature of man — to create — to build — to reach out into the unknown — to explore — and to eventually achieve success.

Industrial arts is not static, it is dynamic. It is a living symbol indicative of our times — a search into the unknown and ever challenging conditions of our times — a search for new experiences, experiences which change with industrial growth — with tools — with materials — and with processes.

It has been said that the purpose of democracy is to organize society so that each member may develop his personality, his well-being, primarily through activities designed for the well-being of his fellow members as a whole. To achieve this end, democracy must rely to a considerable extent on organized education. A broad goal must be created toward which all educational endeavor must gravitate.

It appears, therefore, that our educational system is attempting to transmit a way of life, which I think it should, and does. True, the whole philosophy of our educational system is frequently attacked, but nevertheless, we can point with pride that, as a nation young in years, we have sought out, and are still searching, for what is best in the good life — in art — in music — in literature — in science. The possibilities are enormous.

Home and School

The home and school program should include play, industrial arts (manual training), co-operative activity, and academic work, the whole being varied enough to represent life's demands, and concrete enough to secure an effective response and successful accomplishment by each individual child.

For all children, before the close of the compulsory school period, there should be provided wide variety of experiences, exploratory and practical, in academic and aesthetic work, in gardening processes with tools and machines, elementary commercial experiences and co-operative activities. Such tryout experiences are for the purpose of teaching efficiency in everyday tasks, broadening the social and occupational outlook of the children, revealing to themselves, and their teachers, their interests and abilities. Teachers of all subjects in our schools, industrial arts in particular, should make a definite effort to show the relationship to their occupational life, just as they now relate these studies to other phases of life activity, such as cultural, recreational, ethical, civic, and social.

It should not be taken for granted that industrial arts was accepted into the field of general education without any opposition. On the contrary, the opposition brought forth all sorts of arguments against this intruder of their cultures. For instance, Dr. A. F. Marble, Superintendent of Schools, Worcester, Mass., said: "There is no information stored up in a plow, a hoe handle, steam engine, but there is information stored up in books."* For the defense, Dr. Woodward, Washington University, St. Louis, said: "The obscurities of the text book vanish before the steady gaze of a boy whose hands and eyes have assisted in the building of mental images."* Dr. Felix Adler adopted the view that "tool instruction, workshop lessons, technical training and artistic modeling are essential elements of a general culture. I should plead for it then, as now, simply because of its broadening humanizing effect; because instead of the present one-sided development, it quickens into activity certain faculties of human nature which too commonly lie dormant, it is a step further in the direction of that all-sided development which is the ideal of education."*

If I may, to sum up this brief statement of "My Philosophy of Industrial Arts," I would like to close with a quotation from one of Rousseau's writings, "Would have his son taught the manual arts — if instead of making a child stick to his books I employ him in the workshop, his hands labor to the profit of his mind, he becomes a philosopher, but fancies he is only a workman."

Finally, let us put the whole boy to school, his mind, his hands, and his heart, so that each individual may, in his own humble way, contribute to the welfare of our democratic society in the pursuit of his own personal happiness.

*Bennett, Charles A., *History of Manual and Industrial Education* (Peoria, Ill.: Charles A. Bennett Co., Inc.).

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Obtaining a Basic Understanding —

Drawing, Problem Solving, and Industry

LAWRENCE S. WRIGHT
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While each of the several aims of drawing courses is important and should be carefully considered, the fact is that the aim of developing an understanding of basic industrial processes is all too frequently overlooked. Drawing is an instructional area out of which some fundamental understandings of industry should grow.

For example, do your students realize that original drawings practically never go to the shop? Do they know through what channels ideas commonly go before they are realized in the production of the product in the shop? All too often students who have had a set of project drawings handed to them, or who have found a drawing for project purposes in a popular or professional magazine, fail to realize that there is much of any process involved at all. Here would be an excellent place to correlate the idea of the proper planning of a school shop project, or the product of industry for that matter, with the scientific method of thinking. Could we go one step farther and dare to believe that we might even be in a position to assist students in learning how to solve problems and how to do orderly thinking?

How Industry Solves Problems

If this were to be true, let us take our example directly from industry. A large company which makes a line of farm machinery had this problem reported to them by their field men. A ½-inch bolt which was held in place with a slotted nut and cotter pin was giving trouble. After only a few hours of operation, the bolt would break where the pin went through. The distributors in the field found that they had to replace large numbers of the apparently defective bolt. This problem was given to an engineer in the company to investigate and to solve. Here was a real need. Here was a problem which had been identified.

The engineer's first step was to review the circumstances leading up to this problem. He checked the production prints for the specifications. He found that the bolt (½ x 2½ in. — NF-2 semifinished hexagon-head bolt) was purchased as a standard part. The purpose of this bolt, together with the regular slotted nut, was to hold two parts together. Because there was considerable vibration at this point in the machine, a $^{3}/_{32}$ by ⅞-in. cotter pin was used to prevent the nut from jarring loose. He checked the routing slip to see how the bolt was being modified in his plant. He found that a $^{5}/_{32}$-in. hole was drilled in the bolt to receive this pin.

Arriving at a Tentative Solution

Having made this little survey of past experience with the problem he was now ready to formulate an hypothesis — (suggest a possible solution). Because of the difference in diameters of $^{1}/_{16}$ in. between the hole size and the size of the cotter pin, the relatively simple solution of making a smaller hole in the bolt seemed to be a logical answer.

This possible solution then needed to be tested out. Accordingly, a smaller hole, 3/16 in. in diameter, was drilled. It was believed that this would adequately receive the cotter pin and yet give sufficient strength so that the bolt would no longer break at the pin hole. The machine was equipped with a bolt thus modified and was tested. The parts functioned smoothly. Apparently the problem had been solved.

These data gathered by the engineer were then analyzed, and classified. A recommended change in the specifications was made. These new data were turned over to the draftsman to be included as a correction of the revised drawings. The bill of material was changed accordingly. At least on this particular bolt as used under the circumstances described in this problem, the information thus transferred to the bill of material may be considered as a new generalization resulting from the tests and experiments. The problem had been solved — until further field operations call attention to the need for additional modification.

This illustration, simple though it is, was a real problem. It was solved by applying the steps involved in scientific thinking and represents the way in which most drawings are developed. Somewhere, someone had an idea. In practice ideas are usually based on a need for improvement in a product which already exists. Less frequently an original idea is brought to light which results in the development of a new product. Then come the problems of trial planning, conferences, tentative drawings, and other exploring. An hypothesis or possible solution is formulated. A trial model is constructed and tested. Modifications that are suggested by these tests are incorporated in the drawings and final drawings are prepared.

However, it is not the final drawings themselves that reach the production worker. Rather, it is the reproductions of these original drawings which go to the shop. The original drawings on tracing cloth or tracing paper are then carefully filed away. The reproductions are sent to the various departments and to other interested parties.

Although only one isolated example has been presented, this type of problem solving is typical. It would seem that several conclusions may be drawn from such industrial experiences.

1. The methods of thinking through a problem in industry are real day-to-day experiences which follow closely the method of scientific thinking.

2. Drawings and reproductions of drawings used for production by industry are generally the direct outgrowth

of problems that have been identified and solved.

3. It appears that if our source of teaching content is from industry as stated in *A Guide to Improving Instruction in Industrial Arts*[1] that a part of the work in drawing must be done on a problem solving basis rather than by simply copying line work exercises from the nearest book on engineering drawing.

4. Because the reproductions of shop drawings are the means of communication between the engineer and the industrial worker and because the reproduction of shop drawings is a basic industrial process, at least one unit of instruction on this topic should be included in the work of students in drawing.

[1]American Vocational Association, *A Guide to Improving Instruction in Industrial Arts*, A Revision of Standards of Attainment in Industrial Arts and Improving Instruction in Industrial Arts, 1010 Vermont Ave., N.W., Washington 5, D. C., 1953, p. 10.

Industrial Arts on the Continent to the South —

Industrial Arts Education in Rural Bolivia

EDWIN D. GROVES*
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International Cooperation
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La Paz, Bolivia

The big DC-6B rumbles an unusually long distance down the runway in the rarified air and then bumps over a rough, rocky taxiway to the air terminal of the highest commercial airport in the world. You drive down a steep, winding road which drops a thousand feet to the highest national capital in the world. You are an industrial-arts specialist, assigned by the U. S. International Co-operation Administration to La Paz, Bolivia.

Your first job will be to adapt yourself to the lack of air in the 13,000 foot elevation at which you will live for the next two years. You will be told that moderation in all your habits is necessary for a few days. You may suffer a mild attack of *serochi* (altitude sickness) which causes headache, lack of appetite, little desire to sleep, and sometimes the panicky feeling of waking up at night gasping for breath. If you suffer dizziness or severe *serochi*, the American Embassy has bottles of compressed oxygen which you can use. But you have had a thorough physical examination before you left Washington so you will adjust rapidly and notice the altitude only when you forget and run up one of the many steep streets which are found in La Paz.

You are assigned to the Rural Division of the *Servicio Cooperativo Interamericano de Educación*, a U. S. agency which has been working for 11 years in Bolivia, educating the *Campesinos* (roughly translated as rural workers). You find that your job is twofold. You are to help with an industrial-arts program geared to the educational needs of the young *Campesinos*. You will also help them organize cottage industries to aid their economy, for now they must wrest a bare living from their rocky, almost three-mile-high, steeply slanted fields. In addition, you will have a diversity of assignments, such as helping obtain better maintenance for diesel and gasoline electric generators in the schools, construction supervision, driver education for the office transportation pool, and overhauling electrical installations in the schools. You are a jack-of-all-trades, if there ever was one!

The SCIDE uses a pyramid system in its schools. First are two normal schools, Warisata (Aymara for "Home of the Vicuñas") and Canasmoro, separated by over 600 rough, often fog bound, mountainous air miles. Warisata offers a five-year teacher education program, the extra year to compensate for those students who come without a knowledge of the Spanish language, knowing only their native Aymara. Canasmoro, without a language problem, educates the teachers in four years. Under the normal school is the *nucleo* elementary school, staffed by SCIDE-educated teachers and a little better equipped than the average, through SCIDE assistance. The *nucleo* gives technical and material aid to her brood of sectionals which are handicapped by meager facilities (frequently not even a blackboard) and teachers who are "born to the job" but with little schooling. In addition to this educational technique, the SCIDE has a team of Bolivian specialists, many trained in the States in the fields of health, elementary education, visual education, and crafts. These men and women travel almost constantly from school to school, giving new education methods to the teachers.

The largest industrial-arts installation in rural Bolivia is in Warisata. Separate rooms are provided and equipped for rural arts and crafts, weaving, woodworking, and metalworking. Rural arts and crafts attempts to retain and recreate the ancient Inca, as well as modern design in the mediums of paint, paper, wood, and clay. The teacher has a definite gift in the modern manner and oil-paints the Indians beautifully in the Walt Disney motif. Weaving involves both textiles and rugs, the latter using ancient designs and forms in the Far Eastern fashion. Each tuft is tied individually and the weft woven in, warp by warp and pounded down with a hand-like instrument of wood or bone. Wood and metal shops are more State-side with a few light machines and U. S. tools. In these two shops, student teachers are taught to make their own tools and to use them. This prepares them for the time when manufactured equipment may not be available and when they will have to rely on their own resources and ingenuity in the sectional schools.

In all shop areas, an attempt is made to encourage the teachers to use local materials in the best possible manner. If their teaching assignment is pasture land, they will emphasize spinning and weaving. If they locate near lake Titicaca (highest navigable lake in the world) they will teach basketry using the profusion of rushes found on the shore. *Vareta* is a fungus growth, indigenous to the *altiplano*, looks something like moss when green, and a rough toadstool top when dry, and comes in pieces as large as a tub. When dry it has a BTU rating close to that of good

*Mr. Groves received his bachelor's and master's degrees in Industrial Arts Education from Oklahoma A. & M. College. He taught in Winfield (Kansas) High School for 4½ years before entering foreign service. After working as Industrial Arts Specialist for 18 months under the Foreign Operations Administration in Rangoon, Burma, he accepted his present post in La Paz, Bolivia.

Fig. 1. Warisata, "Home of the Vicuña," reposes at the foot of Illampu, seventh highest mountain in the world. This Normal School, assisted by the **Servicio Cooperativo Interamericano de Educacion**, is on the 14,500 foot **altiplano**, about 60 miles from La Paz. Fig. 2 (at right) Sr. Alcázar, a man specially trained for his job, takes much pride in the cleanliness and perfect operation of the diesel generator in Warisata

coal. If this material, brush or grass is found, the sectional teacher will build simple ceramic kilns for school and community use.

In the SCIDE's other normal school, Canasmoro, modern woodworking tools and machines are being planned, because this is a timber area. Sycamore, cedar, mahogany, and many woods not familiar to the American industrial-arts shop are available for construction and cabinetmaking. Around this equipment will be constructed a new building, modern in design but made of local materials. The common construction basis is the adobe block, about 6 by 12 by 18 in., made of sun-dried mud. These are laid up with mud mortar. Over this is a plaster applied by throwing soft mud on the adobes and smoothing. For a permanent building (to last up to 100 years) plaster, made of fired-on-the-spot limestone is laid over the mud. Rafters and ceiling joists are made of round poles and the roof may be tile, made of cement or soft-fired clay, or thatch. Floors of homes, schools, and other rural buildings are often of packed earth, but the shop will have one of cement. Industrial arts in Canasmoro will also include metalworking and rural arts and crafts. Sr. Jorge Paz, uncle of the President of Bolivia and a leader in this area, is especially interested in having the students learn sheet-metal work so they may find jobs in the planned canning industry in this area. Mahogany is the mainstay timber of the country. Transportation problems prohibit much export at this time, so much mahogany is used for construction within the country. One finds

Fig. 3. Electric wiring is not a fire hazard in the rare air of Warisata. However, even in the absence of insulators, an attempt was made to make the control panel as neat and safe as possible. Fig. 4 (at right). Sr. Rivera, carpentry teacher in Warisata, demonstrates the use of a plane. The tool cabinet is kept very orderly by the teacher and students

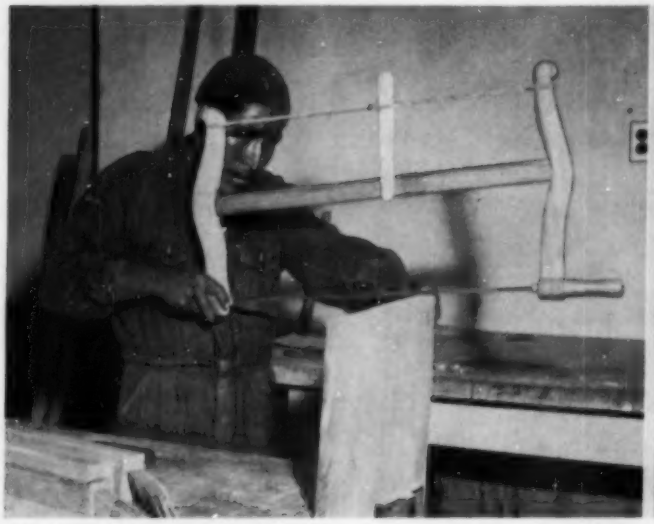

Fig. 5. In Bolivian schools, how to make tools is as important as how to use them. The **campesino** is using a turning saw made from the oak pieces of a machine shipping crate. Fig. 6. (at right). A wooden plane made in the carpentry shop in Warisata. While not streamlined, it works well and is "boy proof"

almost all woodwork utilizing this wood: furniture, doors, window frames, flooring, and even entire buildings. The wood is of good quality but is often not well dried. A plan to aid this situation has been made for the school shops. A two years' supply is to be bought for each school. Half is to be stacked with spacers to dry for a year, and the other half used during the year. In the dry *altiplano* air, one year of drying will do wonders. Following this, a full year's supply of wood will always be on hand, drying for the next year.

Small furniture shops are found almost everywhere. Most of the work is done by hand and a shop sporting a machine or two is a major enterprise. A small, solid mahogany drafting table was made to design by one of these for about $8. Miles and miles of water pipe, ranging from four inch to over twelve inch inside diameter is being made from mahogany by a shop in La Paz. Coated outside with asphalt, this is supposed to last for 20 years or more. In the tropical areas of Bolivia, cart wheels, sometimes ten feet in diameter, are carved by hand from a solid disk of mahogany.

In spite of the handicaps of handwork, moist wood, and difficulties in buying fasteners, hardware, and other necessities, furniture construction is quite good. Blind dovetail joints and pinned mortise-and-tenon joints are used extensively. Wood is stained and filled with a mixture of oil and a powdered color made locally. Shellac is applied as French polish and the craftsman can build up a thick layer in a surprisingly short time. However, design is weak, tending toward the massiveness of the Mission furniture formerly popular in the United States. This design requires extra materials, extra work, and makes the small rooms common in this high country seem even

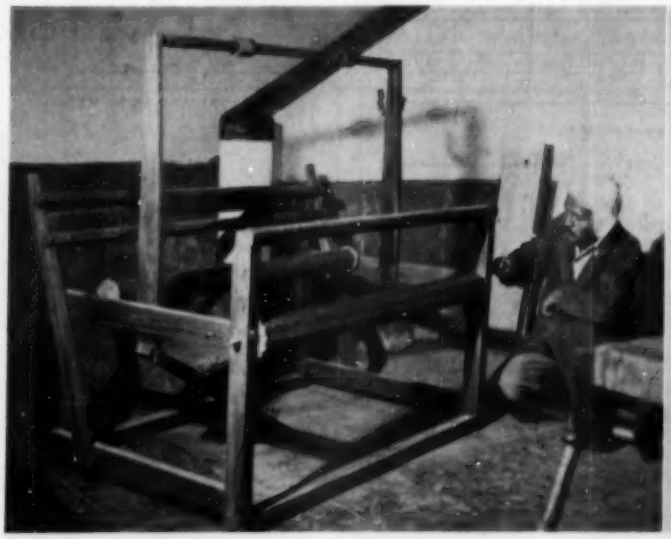

Fig. 7. The Warisata carpentry teacher checks the progress of a loom nearing completion. After this proto type is proven, a number will be produced by production methods for cottage industries in Bolivia. Fig. 8 (at right). The author looks on while his **asociado** operates a small lathe. A young **campesino** on the left is very interested in this piece of American equipment

Fig. 9. A modern book cabinet made to go with furniture adapted from wooden bowls. The llamas are carved from mahogany by Bolivian craftsmen. Fig. 10 (at right). Originally, this bowl was hand carved from a mahogany log for storing fruit and vegetables, or even for bathing the baby. It was polished and mounted on legs and now serves as a magazine holder. An oval of glass could be cut and fitted to convert it into a coffee table

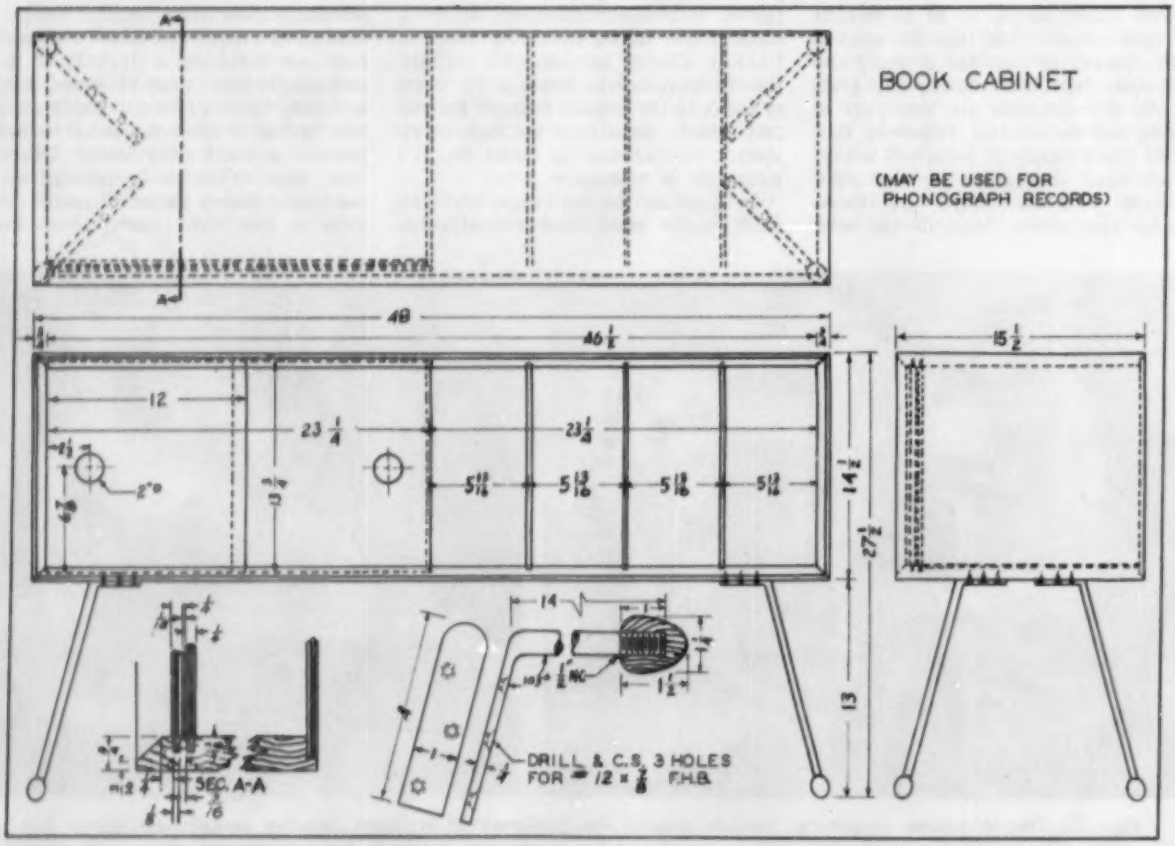

Fig. 11. Detail of the modern book cabinet, which would fit nicely in a living room or den. The legs may be forged from bar stock or fabricated by welding

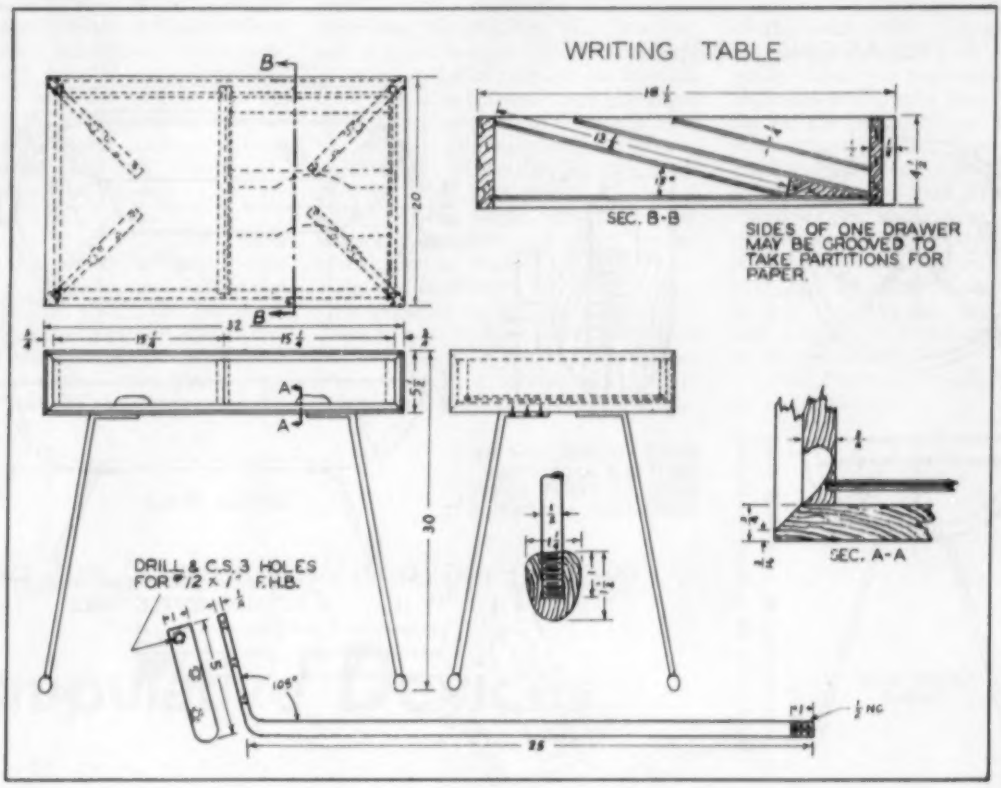

Fig. 12. This writing table is practical for study or typing. One drawer may be fitted for typing paper or stationery

smaller. An attempt is being made, through industrial-arts education, to encourage good, modern furniture design. Drawings that would fit in with local decorating schemes are duplicated and circulated to schools, furniture makers and anyone who might be interested. Many Americans help along the way by having these designs made into furniture which they use in their homes. The school is usually the center of community life and designs in the same motif are used in chairs, tables, and desks. The designing starts with a local craft; simple round and oblong bowls carved by hand for food containers. Drawn from their lowly station, these are made into tables, magazine holders, decorative fruit containers, and fireplace wood boxes by placing wrought iron legs on the sanded and polished bowl. For tables, glass is cut so it will set about two inches below the edge of the bowl. The legs are smooth, ½ inch reinforcing rod, with one end flattened, drilled for screws and bent. The other end is threaded to take wooden pear-shaped knobs, finished to match the bowl. The legs are enameled black prior to installation. To complement these articles, simple, modern book cases, writing desks and similar pieces are made to use the same type of leg. These components of furniture are slowly gaining interest for homes in La Paz.

To help advertise these designs, to obtain needed school furniture and to help the teachers' economy, a building program was inaugurated this year. The shop teachers each chose two students as helpers and all worked during the summer vacation for extra pay. They made furniture and other equipment for the schools from drawings of modern furniture. In addition to the extra pay for teachers and students, this proved a savings in both time and money in obtaining needed equipment.

As happens today in many U. S. cities, La Paz and other Bolivian communities have outgrown their utilities. In spite of attempts to modernize, electricity in La Paz is often unreliable and usually below rated output. Readings taken in the SCIDE office showed that 110-volt outlets were producing an average of less than 85 volts, and 220 volts were actually under 200. To provide for rural schools, the SCIDE originated a long range plan and has provided diesel and gasoline generators of capacity well above present requirements. For example, in Warisata a 10-kilowatt generator driven by a tractor power take-off was replaced last year with a 75-kilowatt Caterpillar diesel installation. It should be realized, however, that the altitude affects both the engine and the generator so this machine actually produces about 45 kilowatts at its 14,000 foot elevation. In addition to driving the school shop machines, and providing lights and heating and radio communications to the La Paz office, it will be used to provide electric power, previously unknown to the small town of Warisata.

In a land where oxcarts are still common, know-how and respect for fine machines cannot always be expected. An experiment was in order. Sr. Juan A. Alcázar, a sectional school shop teacher, needed an advancement to support his wife and six children. No teaching promotion was available. So he was brought in to La Paz and sent for six weeks training to the shop of the local Caterpillar agent. Here, he worked with diesels and, from becoming intimate with the engines, inside and out, gained a high regard for the equipment. Perhaps because of the personal qualities of this man, the experiment paid off. The engine has always been in perfect condition under his care

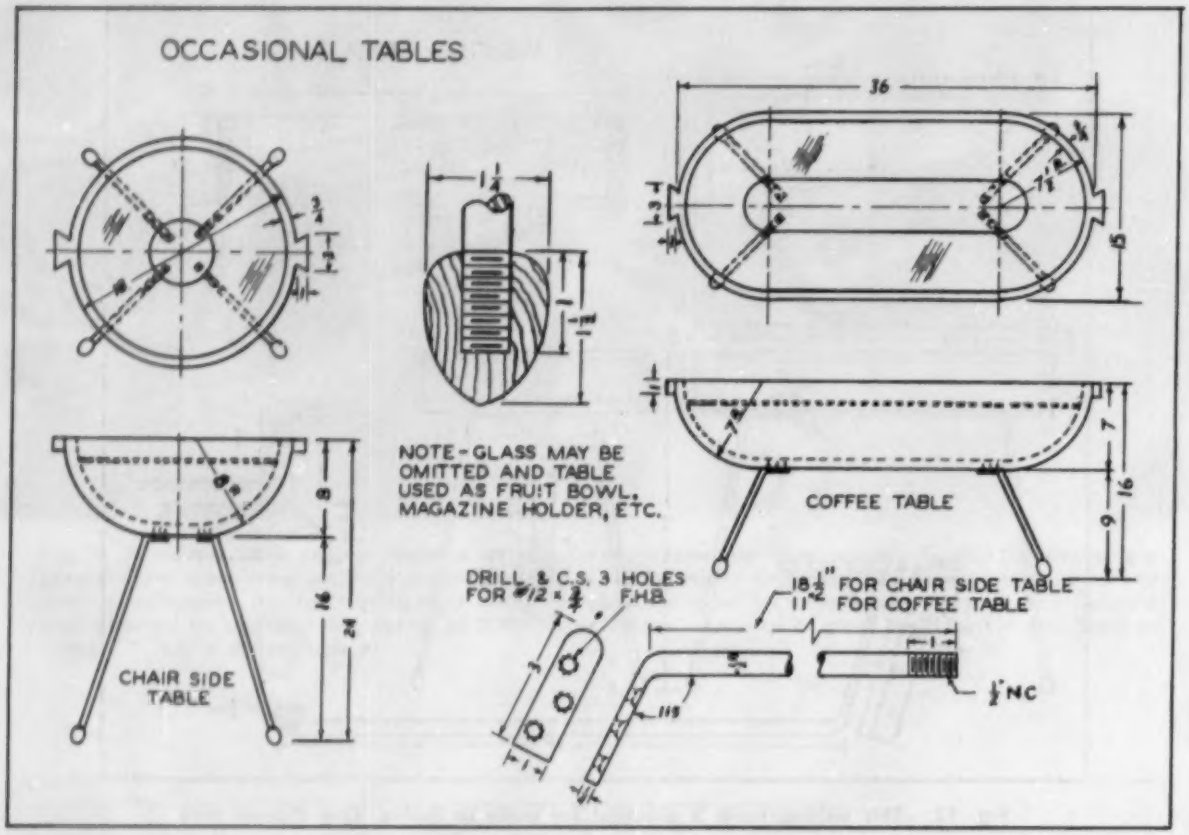
OCCASIONAL TABLES
36
15
NOTE - GLASS MAY BE OMITTED AND TABLE USED AS FRUIT BOWL, MAGAZINE HOLDER, ETC.
COFFEE TABLE
CHAIR SIDE TABLE
DRILL & C.S. 3 HOLES FOR #12 x ¾" F.H.B.
18½" FOR CHAIR SIDE TABLE
11" FOR COFFEE TABLE
½" NC

Fig. 13. Details of occasional tables. The boy who likes to make chips can carve these bowls from a seasoned log. Large salad bowls could be sustituted. For tables, the plate glass should be cut from a templet and edges smoothed and rounded

and its room kept cleaner than most kitchens.

In the cottage industries work of the industrial-arts specialist, the slogans used are "make do with local materials" and "hurry ahead slowly." Necessary items which must be imported are kept to a minimum and local materials are manufactured, often on the spot, into needed equipment. Instead of revolutionizing the method of work, only the most necessary changes are made. The type of loom usually found in the *altiplano* is made of adobe with a reed beater and yarn heddles. To improve this and yet to retain a semblance of local technique, a prototype loom has been constructed in the Warisata shop. The mahogany frame and treddle mechanism were made in the pattern of a U. S. hand loom. The reed beater was replaced with one made of wire and wood. The yarn heddles were retained. The shuttle was improved in size, shape, and smoothness. A fly mechanism will be added after the *Campesinos* become used to the present improvements.

Transportation plays a big part in planning for a rural industries program in this country. With the mountainous terrain, the loose, unstable soil, the heavy rains, and the lack of modern transportation methods, shipping of commodities into, out of, and within Bolivia is difficult. Railroads connect the larger cities, but are often delayed by slides and washouts. Roads, often only narrow shelves 1500 feet above a valley, become impassable for trucks for weeks, during the rainy season. Airplanes, rapidly becoming a major factor in Bolivian transportation, are often grounded by bad weather. So, in planning for rural industry, a minimum of transportation is necessary. For this reason, products which have the highest value for their weight must be considered. For export, wood carvings and small, carved pieces of furniture are being planned, to be made near the timber areas. Textiles are being started in the *altiplano* where exist the llama, vicuña, sheep, and goats. At the start, these products will be made for Bolivian consumption and later, when skills improve the quality, export attempts will be made. Practically no table ceramics are made in Bolivia and modern hand methods will be introduced to help supply local demands. Later, Inca designs will be incorporated in ceramics as art items for export.

Life, for the American technician in La Paz, is full, varied, and interesting. In spite of the altitude, a person keeps active with many Americans engaging in such sports as golf (highest course in the world), tennis, and swimming. Many homes have small swimming pools in the back yard which also serve as emergency water supplies. Fishing is popular and 20 pound trout are often caught in lake Titicaca. Commercial entertainment, such as motion pictures, theater and the like are not so popular as informal association. Entertaining of Bolivians or other Americans in the home several times a week is common. These gatherings are varied by the showing of pictures of one's last post (often halfway around the world), dinners, "talking shop," and recorded music. One Bolivian has a record library of several thousand disks and has open house each Saturday night for a four-hour recorded concert for everyone interested. High fidelity has reached South America and several Americans have fine equipment with large collec-

tions of music on records and tape. The Bolivians love parties and have one at the drop of a sombrero. Parties (*despedidos*) are spontaneously organized almost every week for someone who has been promoted, is changing his work, or is going to the States. At large parties, the Americans may rub elbows with important national figures who are very gracious and human.

One of the most impressive events held was the Fourth of July picnic given by the American colony. This was in real American style, with hot dogs, hamburgers, soft drinks, and coffee (this is south of the equator and the Fourth comes in the winter), horse shoes, pony rides, and baseball. The afternoon closed with a short, impressive talk by the American Ambassador, flag lowering, and a single mortar shot. As the sound of this detonation echoed for minutes, back and forth between the high canyon walls, thoughts of home brought a lump to the American throat. But, as the principles of the "Union of the Americas" and the small part one is playing in solidifying this union follows in mind, shoulders straighten and new ideas begin forming to improve the job.

So the assignment of the industrial-arts specialist in Bolivia comes to its close. You think back about your work and re-value what you have done. You find you have not accomplished all of your plans. You have been ambitious, but motion is a bit more leisurely south of the border. Still, you can see progress made through your efforts. Personal friends you have made among the Bolivians will always have a warm feeling for the United States. Workers you have trained will continue striking the anvil and carrying on your work. Little communities you have helped in their industrial aspirations may someday grow into manufacturing centers of Bolivia. As you again board your plane for the long, long run, and as the wings begin to grip the thin air, you must agree that your work is the most satisfying in the world.

NOTE: Photographs and drawings are by the author.

Helping the Student to Visualize —

Manipulative Devices

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Teacher and/or pupil built 3-D manipulative devices are excellent visual aids. Are you using any? No!

Let's see what these devices are doing for some industrial arts and vocational education classes. You may be missing something.

Cuthbert Sandstrom, Rose City Park School, Portland, Ore., says, "I like large aids so that they can be seen by every student. During many demonstrations, the pupils cannot get a clear picture because the 'real thing' is too small. If visual aids are used, they are often too small also. Take saw filing, for instance. It's pretty hard to demonstrate the proper filing angles for rip and crosscut saws. The teeth are quite small." That's why Mr. Sandstrom uses a teacher-pupil visual aid, Figure 1. The enlarged plastic saw teeth make it possible for all of the students to gain a clearer picture of the proper rake and set of the teeth. In addition, the enlarged file can be manipulated for instructional purposes.

It has been said that the most useful manipulative aids can be taken apart and assembled again. That's exactly what Mr. Sandstrom had in mind when he made the model *plane bit*, Figure 2. He also had in mind the importance of enlarging his *model bit* to a scale convenient for class observation.

Howard Snow, Moccasin (Montana), High School uses manipulative models to introduce basic types of wood joints,

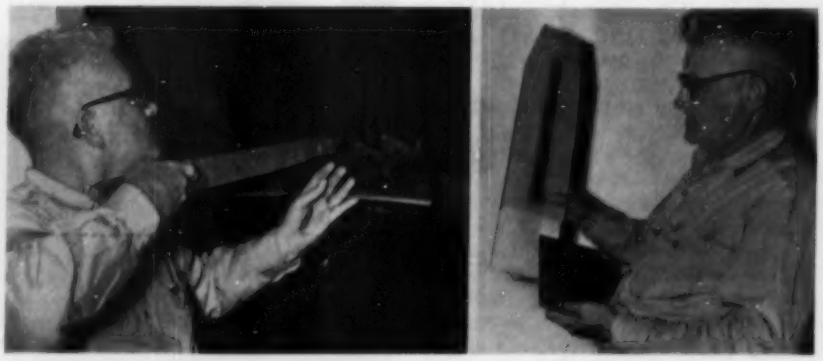


Fig. 1. This effective manipulative aid is being used to demonstrate saw filing by Cuthbert Sandstrom. Fig. 2 (at right). Mr. Sandstrom finds it necessary to enlarge many of his 3-D manipulative aids to a size convenient for class observation. The enlarged scale model plane above and the saw filing demonstration in Fig. 1 are two examples

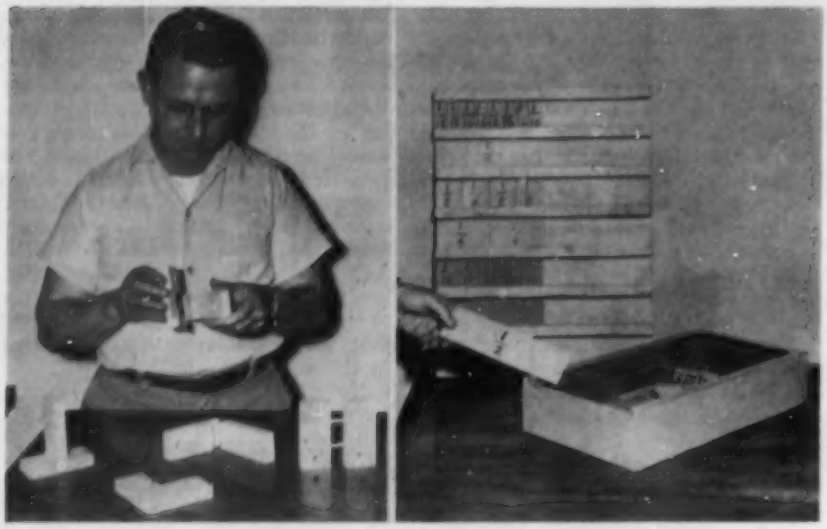


Fig. 3. Basic wood joints are difficult for some students to visualize. That's why Howard Snow uses 3-D manipulative aids to supplement textbook and chalkboard illustrations. Fig. 4 (at right). This type of manipulative aid gives concrete meaning to basic arithmetic. The "key" to the whole idea is keeping the area of each fraction in true proportion

Figure 3. Students manipulate these joints for review.

Fractions are always a problem. One manipulative type visual aid is shown in Figure 4. The *key* to the whole idea is scaled area for each fractional representation.

At Reedsport (Oregon), High School, Bob Lanway uses a *manipulative model cabinet*, Figure 5. "Its main purpose," says Mr. Lanway, "is to (1) give realism to classroom study material and (2) to allow the students to handle and see many parts of a *basic cabinet*. For instance, when a student is building a drawer with many different cuts and parts, nothing helps more than to be able to see the relationship between his work and the finished product."

Another type of manipulative aid is the *electric board*, Figure 6, made by Gordon Asbury's students, McMinnville (Oregon), High School. Various materials can be attached, e.g., woods, hardware, written questions, etc. When the correct button is pushed, a buzzer rings on this board. On some more elaborate *electric boards* cheerful chimes ring for correct answers and a horrible sounding buzzer groans at wrong attempts. To minimize classroom disturbances some teachers prefer to eliminate bells, buzzers, etc., and use only a light that flashes for correct answer.

Worried about students memorizing the matching sequence? That's no particular problem — providing the circuits on the back, Figure 7, are changed at irregular intervals.

Have you had trouble trying to teach gear ratio from the textbook and chalk board? Lee Henningsgaard, Cottage Grove (Oregon), High School did. That is, he had trouble until he came up with the idea shown in figure 8. With the aid of the plywood gears, Mr. Henningsgaard's students are now able to understand and work basic gear ratio problems easily.

If these examples point out anything at all, they indicate that (1) master industrial-arts teachers find student and/or teacher built manipulative aids are effective supplementary material, and (2) that many of these aids can be built with common materials available in the school shop. If you are not using manipulative aids, perhaps your classes are really missing something.

NEW LOOK: SQUAT AND CHUBBY

Squatter, chubbier tires will be featured on the new 1957 automobiles rolling off assembly lines this fall. The smoother-riding, fatter models are said to cushion shocks, bumps, and vibrations more easily than present tires. Actually, in recent years, more than the shape of the tire has changed. Today's tires are made from materials entirely different from those of 15 years ago. Oil-based, man-made rubber has largely replaced the tree-grown variety as the principal ingredient, while petroleum-derived rayon and nylon have replaced cotton cord for tire reinforcement. This quiet revolution, brought about by the skill and ingenuity of the tire and petroleum industries, makes driving increasingly pleasant for motorists on the nation's highways. — *Petroleum Newsnotes.*

In total mileage, our domestic transport system would encircle the earth 96 times — enough to provide nine separate routes to the moon. — *Chemical News.*

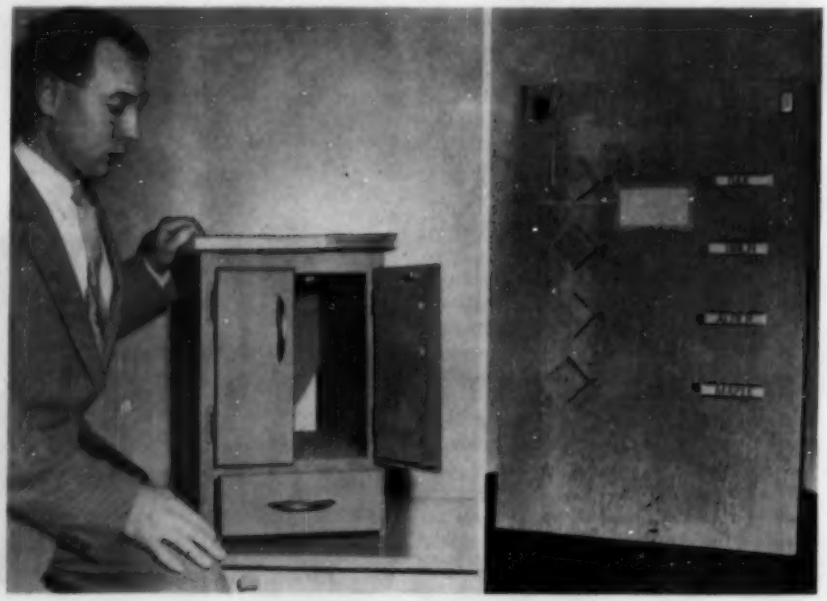
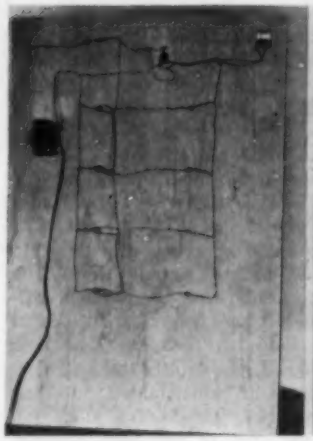


Fig. 5. This "basic" cabinet, used in Bob Lanway's classes, allows students to handle and manipulate various parts. Fig. 6 (at right). "Electric boards" add zest and interest to industrial-arts work. Various materials can be attached



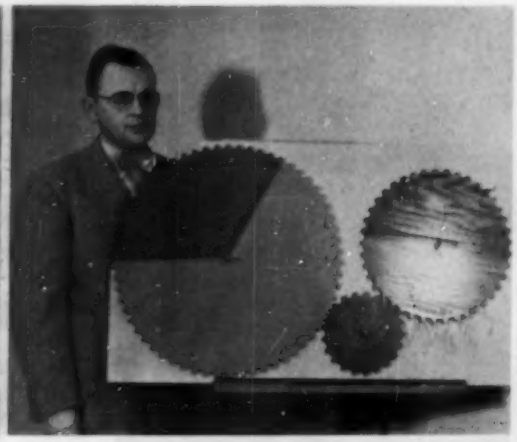


Fig. 7. Students soon remember the correct matching sequences. To alleviate this the writing on the rear should be changed sporadically. Fig. 8 (at right). These plywood gears have made this phase of Mr. Henningsgaard's instruction real and concrete at Cottage Grove, Ore., high school. Perhaps it can do the same for you

Handicrafts for the Refugees in Jordan —

Handicrafts Education Program for Jordan

DOUGLAS RUGH

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Article submitted by

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The Handicrafts Education Program for UNRWA-UNESCO schools in Jordan which will be inaugurated in October, 1956, can be described as a new program in several important and significant aspects. In its purpose, curriculum, place in the school program, facilities, and staff, it promises to be a major educational advance for the refugee schoolboys of Jordan. It presents a radical change in the concept of manual education and its relation to the traditional academic curriculum in the Near East.

Some mention should be made of the Gaza experience before presenting the Jordan Program. It was in Gaza during the school year 1954–55 that handicraft education of this type was first offered to 2000 Arab refugee boys. Initially there was intense and at times violent opposition to this innovation by both parents and pupils. The parents thought it was an attempt to weaken the traditional schooling by replacing it in part with uncalled for vocational instruction. They did not at first accept the idea that it was to be a normal part of the school curriculum, a normal right for boys to have manual education along with the time honored three R's. It was largely due to the personal leadership, persistence, and patient persuasion of James M. Milligan and his staff that this new program was finally tolerated and then accepted in Gaza. From 2000 boys in 1954–55, the enrollment in the handicrafts courses rose to 16,500 in 1956, an increase of over 800 per cent.

Today in Gaza there is only wholehearted and enthusiastic support for the school handicrafts program by the Egyptian authorities, the parents, and most important of all the students. It is now necessary to lock the shop doors to keep the boys out after hours. This

(Top) A general view of the school and of the exhibition notice board. (Center) Examples of metalwork made at the instructors' summer school at Gaza. (Bottom) Examples of the work

year there were 20 local exhibitions of the boys' production and one large central exhibit attended by many dignitaries and including the award of a silver cup to the best unit. So, attitudes have changed in Gaza concerning handicrafts education. The same pioneer work will not be so difficult in Jordan because of the now successful Gaza experience.

The purpose of the handicrafts education is twofold. It aims to provide handicrafts training as a normal element in boys' education and to create the proper respect and appreciation of hand-

work. It does not aim at producing carpenters, metalworkers, or employable skills.

This program will be offered to boys in the V and VI elementary grades and in the I and II secondary years of the regular school program. The subjects of woodwork, metalwork, and technical drawing will each be offered two hours per week for a total of six hours of handicrafts each week. These subjects will be taught in specially constructed native stone workshop units of three rooms, one for each subject, built in a T shape. Each workshop will be located adjacent to a school and will normally be located in the school compound.

It is not possible to supply all schools with the handicraft workshop units for 1956–57. The construction program for this year includes 30 units to serve 8500 refugee boys. Sixteen additional units will be constructed for 1957–58, bringing the total to 46 and serving more than 14,000 school boys. The Units now under construction and to be ready for service in October, 1956, are located as follows:

Jericho Area, 8 handicraft workshop units; Nablus Area, 8 units; Hebron Area, 4 units; Jerusalem Area, 4 units; Irbed Area, 3 units; Amman Area, 3 units. The 1956 total is 30.

In some of the larger camps there will be more than one unit. For example in the Aqabet Jaber Camp there will be 3 and in Ein Sultan and Karameh Camps there will be 2 each. Units will not be constructed where there are not enough boys to use them to capacity for economy reasons.

Each unit will be equipped with the necessary handtools for woodwork and metalwork, and the instruments for technical drawing. Illustrated textbooks in woodwork and metalwork will be provided in each unit.

The handicrafts teacher is obviously a key factor in this program and providing them is a major problem. During the school year 1956–57 not less than 85 teachers will be needed. Candidates are selected from the staffs of UNRWA-UNESCO schools on the basis of technical background and experience. A candidate must have at least one year of successful classroom teaching and the more technical background the better. Only men are considered.

There is a 3 month summer training program for handicrafts teachers (July 1 – September 30) conducted at Kalandia Vocational Training Center under the direction of James Milligan. Instruction will be given five hours daily, six days per week in the subjects: woodwork, metalwork, technical drawing, and methods of teaching. Trainees will receive as much practical shopwork as possible. Appointment to teaching posts will be dependent upon successful completion of this course. The trainees will be required to take an additional summer training course during two following summers. In Gaza the third summer session will be offered in 1956. While it is realized that this is not adequate training for the type of instructor desired it is the best that can be offered under present circumstances. A similar training course will be offered for 30 trainees during the fall season in order to increase the number to the minimum called for. The summer program is limited to 64, the capacity available at Kalandia. Trainees will be residents at the Kalandia Camp schools, vacant during the summer months, and conveniently adjacent to the Kalandia Vocational Training Center.

(Top) Mr. James Milligan of Glasgow supervising metalwork in progress for intructors. (Center) Critical examination of woodwork projects. (Bottom) Shaping a desk handle

The cost of the handicrafts program will be of interest to educators. The average recurring cost per pupil is estimated at $15.60 per year. For the period October, 1956, to December, 1957, a total of $373,000 will be allocated to this program for construction, supplies, and equipment. This figure does not include the cost of teachers' salaries. The capital cost per workshop unit for construction and tools amounts to $6,863. The estimated recurring costs per unit, including consumable supplies, staff, and maintenance, amounts to $4,426.

The curriculum in handicrafts education will include first, training in the correct use of tools and then graded work for each class from V elementary to II secondary in each of the subjects: woodwork, metalwork, and technical drawing. Each boy will draw the model of the object he will create. Such things as boxes, tables, simple wooden toys, cutting, bending, and twisting metal into useful and ornamental shapes as well as mechanical toys have all been part of the program in Gaza and will be the work in Jordan schools.

James Milligan, principal lecturer in technical subjects at the Jordan Hill Training College for Teachers, Glasgow, Scotland, is the general supervisor of the handicrafts program. During 13 months in Gaza, Mr. Milligan and his staff pioneered a program that not only overcame all criticism and has now been accorded wholehearted support, but has had difficulty in keeping up with the demand. In Jordan there is every reason to believe the Gaza experience will be duplicated with equal success and without the initial opposition. The refugee boys of Jordan will now have a chance to find in their regular schooling an opportunity for creative handwork which is every boy's natural right, and another constructive dream of UNRWA's Education Division will become a reality.

Don't throw away that baseball bat junior broke at the handle. It can be made into a novel lamp if drilled through the center, with the broad part fastened to a base and a lighting fixture attached at the other end. It should be finished with a thinned coat of white shellac that is pure and fresh. — *Shellac Information Bureau.*

Interesting and Worth-While —

Modeling in Architecture

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Menomonie, Wis.

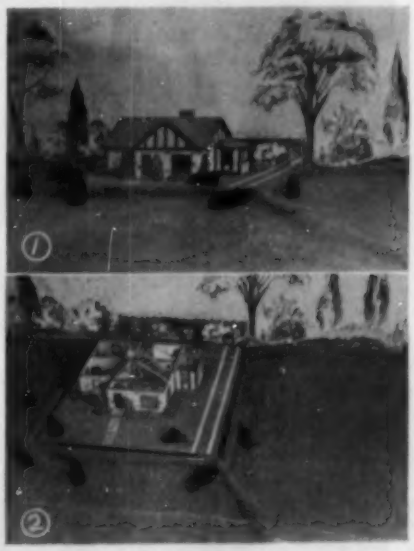
The making of scaled models of houses or building projects in architectural drafting classes is an accurate method of seeing just how the building is going to look. When the draftsman can see his work produced in concrete form he is able to see just what could be changed advantageously, and how it would improve the general scheme of the layout and the design of the building. The blending of the materials, even the color scheme can be worked out in advance of the real building. Elevations, ground levels, driveways, and the landscaping can be worked out, all before the actual building is started.

In order to make a perfect answer to "how is the building going to look" it is best to make a complete mock-up of the whole problem and then take pictures of the various jobs both in color and black and white. To see a home in Kodachrome will solve any questions or doubts as to how the house will look when it is completed. Over a period of several years this procedure has been followed and the slides used in the classroom for further instruction to students who are contemplating making a model for their class assignments.

Most students feel that the time required to make a model is well worth it. They are able to see where they would improve the proportions of various elements, and also change the color schemes on the elevations which would make the completed building a more pleasing structure and surely more valuable when it comes time to sell it.

The building of a model is perfectly suitable to any class in drafting above junior high school. Many students in high school are already adept at making model airplanes and a house model is practically the same thing except that a working drawing of the model must be prepared first. Complicated models may be a little too advanced for the beginner but if the model has some difficult work and some complicated details to make, then it is wise to put two or three students on the model so it is possible to complete the model in the required time.

Model making is visual education and although a picture is worth a thousand words, the actual model is concrete and many students see things they are very apt to overlook when they are studying a picture. It is interesting to watch youngsters when they see a picture of something that they actually know about, but when they can fondle a model of the pictured object it is another story and means much more to them because it is in concrete form.



All models shown in this article were produced in the author's classes.

The making of a model of a future home is an excellent way to show where costs can be reduced, and one can also see whether the making of a change will actually improve the completed structure. It is all right to make a change here and there, but there is a limit and to establish that point, the model will point out quickly just where and what can be done wisely.

It is interesting to see the photographs of model setups in the current building and home magazines, and it is difficult to detect in these photographs whether they were taken of a model or of the real thing. To see a jury of architects grouped around a huge model of a city layout is mute evidence that a model actually serves its purpose when designing a huge project. Model airplanes, wind tunnels, boats, kitchen setups, shop layouts, setups for movies, mock-ups of new car designs, homes, and bridges, and layouts of complete cities all attest to the value of such a procedure in planning.

Photography has resorted to many model setups for backgrounds, poster layouts on which another photograph of a living model is superimposed making an almost unbelievable picture story. Teachers of industrial education and trades have laid their shops out in model form first, in order to establish an efficient line of travel in production used in most of the shops in the U. S. today. If one can see and then actually feel the model, the impression is permanently made on the human mind.

Frank Lloyd Wright's models of his masterpieces illustrate the value of modeling in architecture for his student architects. The same will hold true in any class where architectural drafting is taught. A concrete visual aid is an inspiration to the student.

We have used many models in the classroom to illustrate styles in architecture along with photographs in the form of 2 by 2-in. slides and in the brief time of 20 minutes have a class thoroughly posted on what to look for in any individual style. In a period of several weeks the students in architectural drafting are able to identify a group of twenty styles or more and name all of the characteristics of any one style. If assignments were made for

reading, the time consumed would stifle all interest to learn about any of the styles. Models of construction details of various parts of a building including walls, cornices, fireplaces, and stairs are also very valuable when teaching the elements of building to a beginning class.

The cost of materials for a model is very little, probably averaging $1.50 or less. However it takes considerable time and patience because most of the details are at ¼- or ⅛-in. scale. If the model is smaller, then most of the buildings in a model setup of a city layout are made of blocks of wood. But the scale is accurate for houses, public buildings, trees, cars, and people if they are used.

The skills required are not extraordinary and anyone with the most elementary ability can make a model. The main thing is to be sure and keep in mind that all things must be accurate and in scale. One little detail out of scale will put the whole scheme out of line because the eye is quick to detect these little discrepancies no matter how small. And if a photograph is made of the model the camera is sure to bring it out in exaggerated detail. In taking a Kodachrome of a model, colors of background, foliage, trees, grass, and the house itself should be exact because here again the camera will surely pick up colors that have been put in the wrong place. A piece of 6 by 8-ft. terry cloth dyed the proper shade for grass, can be used for depicting rolling land or terraces, by placing wads of cloth under the terry cloth at various places. When doing this it is advisable to see that the house is level, if necessary use a small level to be accurate.

Backgrounds on the photographs were made on a 36 by 72-in. white window shade. This, cut in half, gives an 18 by 72-in. panel, which is then taped to a board in a vertical position at eye level. On this curtain, sketches of trees, bushes, fences, and hedges are made with a carbon pencil. The various heights of the foliage should be planned for a variety of types of trees and bushes. As the background recedes the weight of lines should be somewhat lighter to give apparent depth to the landscaping. Possibly a hill here and there may add to the depth of the picture. A sketch in carbon pencil is suitable for black and white photographs only. If the background is for a Kodachrome it is necessary to make up the foliage in suitable colors appropriate for the various trees and bushes. For several backgrounds it is advisable to change the general appearance of each background. For the color work

Crayola, Mongol, and pastel crayons may be used. If it is necessary to blend some of them for the darker tones, water or benzine should be used according to the material selected. The sketch is made the full length of the curtain (6 ft. by 18 in.). With this length it is possible to change the setting for a photograph by setting the model in different places in front of the background. Three lights should be used, two floodlights No. 2 and a spot over the head of the model. This arrangement seems to give the model the most lifelike appearance in the finished photograph. Exposure readings are a must, small apertures are required for a reasonable depth of field, and a steady tripod, speed 1/10 to 1/50 of a second.

Tools and equipment are at a minimum for this kind of work. One student in model making made the whole problem with a razor blade. He could do the finest work with this medium, even to splitting a double edged blade for convenience. However this is not advised for the beginner. It would be much better to have a good knife with two or three sharp blades. The ideal set of tools is the Exacto set which is one of the requirements for the students in model making at Stout State College. Most of the work is cutting, and if there is any sawing in laying out the base this can be done on the band saw or on the jig saw.

The base of the model is usually made of masonite or insulite board. Make it just a few inches larger than the model itself. In landscaping it can be placed on another piece of board the size of the proposed lot.

The next thing is to have a blueprint of the plans made so they can be transferred to the material the walls are

going to be built of. This wall material can be of masonite, wall board, Strathmore board, or balsa wood. The last medium seems to be the most flexible and warps the least outside of masonite. It does make the best roofing material especially when the model has a flat roof.

Assuming that the model is going to be made of balsa wood, it can be made of ⅛-in. material, or of two pieces of 1/16 in. glued together. The advantage of this is that it is easy to cut the window openings and insert the celluloid windows between the two thicknesses. The problem of gluing them in the middle of the wall is an easy matter. The windows of celluloid are marked and laid out according to the elevations and scored with a blunt point with the thickness of the muntin or bars of the window, then they are wiped with a white material-like poster paint or a flat paint and wiped clean, this leaves the muntin bars of the window as shown on the elevations. Another way is to cut strips of paper and glue these to the windows. The only recommendation concerning this method is to use it when the division between the windows is greater than the thickness of a muntin bar. All gluing is done with airplane cement. Other glues are good but the setting time is a factor in making a model of any kind.

After the elevations have been transferred from the blueprint to the balsa wood, they are cut out to the proper length, window and door openings are cut out and the windows placed as mentioned above. The next step is to cut out a piece of wood about ¼ in. thick to fit the inside dimensions of the floor plan. This is a piece of bracing to which all of the walls are fitted. An easy method is to glue the plan to a piece of material and then cut it out very accurately so the wall will be square and at right angles to each other. The corners of the walls can be butt jointed or mitered if desirable.

If the walls are to be of siding, it is best to score the lines with a stylus pen or any blunt instrument. The gluing on of paper to represent siding is very tedious and questionable when finished. If it is desirable to use paper siding use a good grade of white drawing paper that will stand a white tempera paint or colors.

Stone and brickwork can be painted in with a drawlet pen. The best method of representing stone is to cover the walls that are to be stone with a coating of textone and just before it is dry score in the stone joints, when dry, sand the surface and tint the stone with water colors. This method seems to make the most realistic stone work. There is a paper made with the brick printed which is pasted to the outside

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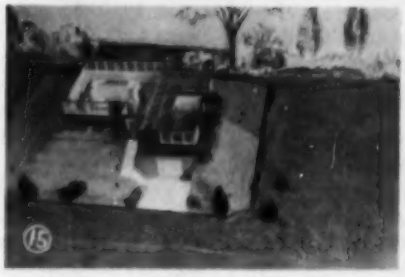

(15)

walls when they are of brick but it is not to scale and the modeler is hampered by having to use one or two colors. It is better to score the walls and paint in the brick by hand. If necessary make your own brickwork with a ruling pen and coloring.

The partitions are now added of ⅛-in. balsa wood according to the plans. Door openings are also cut at this time and the partitions are placed into position and glued. The painting is done after their installation and for this use a poster paint which can be mixed to any pastel shade.

The bathroom fixtures and kitchen layout are carved out of soap. The other rooms such as the bedrooms and living room can be furnished easily, by making the furniture out of balsa wood and coloring with water colors to match the interior decorating.

The advantage of having the model laid out with the rooms and accessories makes it convenient to study the layout and to make the desired changes at this time. Women seem to be more interested in the layout of rooms and understand them because of their familiarity with the actual working conditions in a livable house. In several displays of models it has been noticed that women are more interested when the roof is taken off and they can see the inside layout of rooms.

The roof is the last piece of work to add to the model to make it a finished job. This is made of a stiff cardboard, balsa wood, or masonite. From experience with the various materials, masonite seems to be the most rigid and permanent type of roofing to use. There is no warping of the roof after applying the shingles and painting, since moisture has no effect on masonite. Shingles are made in strips and then glued to the roofing starting from the cornice and working up to the ridge of the model. They should be laid about 6 in. to weather and to a ¼-in. scale. There is another way to make the shingles and that is to cover the roofing material with a thin coat of textone and then score it while it is in a semi-wet condition. This method is much faster than the gluing of the shingles on in strips. The roof is then painted the desired color.

The landscaping is another detail that makes the model so realistic. Place the model on a piece of masonite or insulite the approximate size of the lot. On this board place textone just as is applied to the wall to represent stone, then while in a semi-wet condition take a stiff bristled brush and stipple to represent grass, which is colored with a dull flat paint the shade of grass desired. Another is to apply flox to imitate grass. For a hilly plot of ground, build up the knolls and valleys with a wire mesh screen and then apply the textone and color. Trees and bushes are made of sponges painted or dyed the desired shade. Walks in concrete, stone, or brick can be made of textone applied to a board and tinted the proper shade. The ten cent store will furnish cars and figures at a suitable scale if necessary.

To make this story come true, build one.

Industrial Arts and Vocational Education

JOHN J. METZ, Editor

GUARD AGAINST EYE INJURIES

THE 1956–57 school year has already started. You have met your students, and, most likely, the first impression was good. Did you give an equally good impression to the pupils?

Whether or not they have found you — their instructor — as acceptable as you have rated them, does not make much difference. No matter what they think of you, they are your charges and you must do your utmost to help them with their studies so they may advance not only in their knowledge but also in acquiring the right habits, attitudes, and understanding of how to get along with their fellow students, with the members of their families, their neighbors, and themselves. You must help them take care of their health, their minds, and their bodies.

Since many of your students will enter industry you must see to it that they are well based in the knowledge of how to work safely.

Probably one of the most dreaded crippling accidents is one that deprives a person of the sight, whether of one or both eyes. A new book, *Industrial Vision*, which is to appear shortly from the publishing house of Chilton and Company of Philadelphia 39, Pa., states that about 75,000 disabling eye injuries occur each year in the U. S. A., and that 72 per cent occur on jobs regarded as nonhazardous to the eyes.

This points to the fact that there is need for increased knowledge and training for all concerned with the training of youth in general, and in particular with that which has to do with instructing students in the use of tools, materials, and machinery.

The writer must admit, and he does it in all humility, of having failed again and again when he published pictures of boys working in school shops without observing safety regulations. Too often he has fallen in love with a picture and has overlooked the need for analyzing it to see whether it portrays good safety practice.

Unfortunately, too few shops, both in industry and in schools, insist on the use of goggles, not only when grinding at an abrasive wheel, but also when using hammer and cold chisel, or when working on the lathe, drilling machine, shaper, planer, milling machine, as a matter of fact, when performing any and all of the many tool operations that come up in industrial work.

As a matter of fact, the machine shop is not the only place where goggles should be worn to protect the eyes. Boys and men in the woodworking trades also have had eye injuries that might have been avoided had they worn goggles.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION has published several articles describing school shops in which every student has to wear goggles. This is a very good practice which should be followed by all shop teachers. Probably it would be well to read over some articles on the subject of eye protection from past issues of this magazine to get an idea of what you can do in this regard in your own shop. A few references follow:

"Eye Protection in the School Shop," Gerald W. Shipman, January, 1956, page 8.

"A Student Eye Protection Program," Alfred S. Drew, September, 1954, page 217.

"Eye Protection in a School Safety Program," Roy R. Van Duzee, September, 1953, page 203.

"Safety Goggle Program in the School Shop," John L. Hopkins, September, 1950, page 293.

The National Society for the Prevention of Blindness has just issued a new publication authored by James E. O'Neil, the Society's Director of Industrial Service, who states that "hundreds of thousands of American youngsters are working each day in school shops where eye hazards are as great as those which exist in the industries they will eventually enter."

He recommends that students, teachers, and visitors be required to wear eye protection while in the school shop environment. In addition he said that students who ordinarily wear eyeglasses have an even greater need for safety eyewear. In most instances it is safer for a student to have no eye protection at all than to wear ordinary glass lenses in a vocational shop.

Mr. O'Neil finds that far too few schools have instituted adequate eye safety programs.

Let us make an effort to change this in the school year 1956–57.

IMPRESS YOUR STUDENTS WITH THE VALUE OF A HIGH SCHOOL DIPLOMA

THE back-to-school committee sponsored jointly by the U. S. Department of Labor, and the U. S. Department of Health, Education, and Welfare, calls attention to the fact that our country is facing many very critical problems, one of the greatest of which is that so many of our people lack education and training in skill.

They have found that an interview of 200 large firms in 1954 discloses the fact that one half of those concerns were unable to find enough research scientists and engineers to meet their needs, and that there were substantial shortages of such workers.

Right now 250,000 trained workers must be produced each year if we want to maintain the present skilled work force. What can be expected as we advance into the future?

In 1960, it is estimated that 210 atomic reactor operators will be at work, and that this number will have grown to more than 18,500 by 1980.

The armed forces can find only three qualified specialists for every four that are needed.

In 1910, 33 per cent of the workers in the United States were unskilled and worked at jobs that required little education. In 1950 only 20 per cent belonged to the unskilled group, and this is dwindling rapidly.

Ten years ago, 78 per cent of the 14 to 17 years-of-age group were enrolled in school; today 87 per cent are enrolled.

Ten years ago, 40 per cent of the young people in school stayed to be graduated. Today, 55 per cent were graduated.

The 1950 census showed that among men 25 to 64 years of age the *least likely* to be unemployed were those who had college training, the *most likely* were those who had an eighth grade, or less, education. This census also showed that high school graduates have a much better chance to get a job than do nongraduates.

Employers do not want to waste time training employees who cannot be trained. The beginner in industry who has a high school diploma can show the employer from whom he wants to get a job, that he has the training and education upon which careers are built, and employers know and appreciate that.

Problems and Projects

WROUGHT IRON BRACKET

ARTHUR C. WENZEL
Principal
The Pennsylvania School for the Deaf
Philadelphia, Pa.

This particular bracket was designed for use on a divider shelf unit to strengthen the construction and to add a decorative effect to the project. However, it may be used on wrought iron projects and may vary in size according to where and how it will be used.

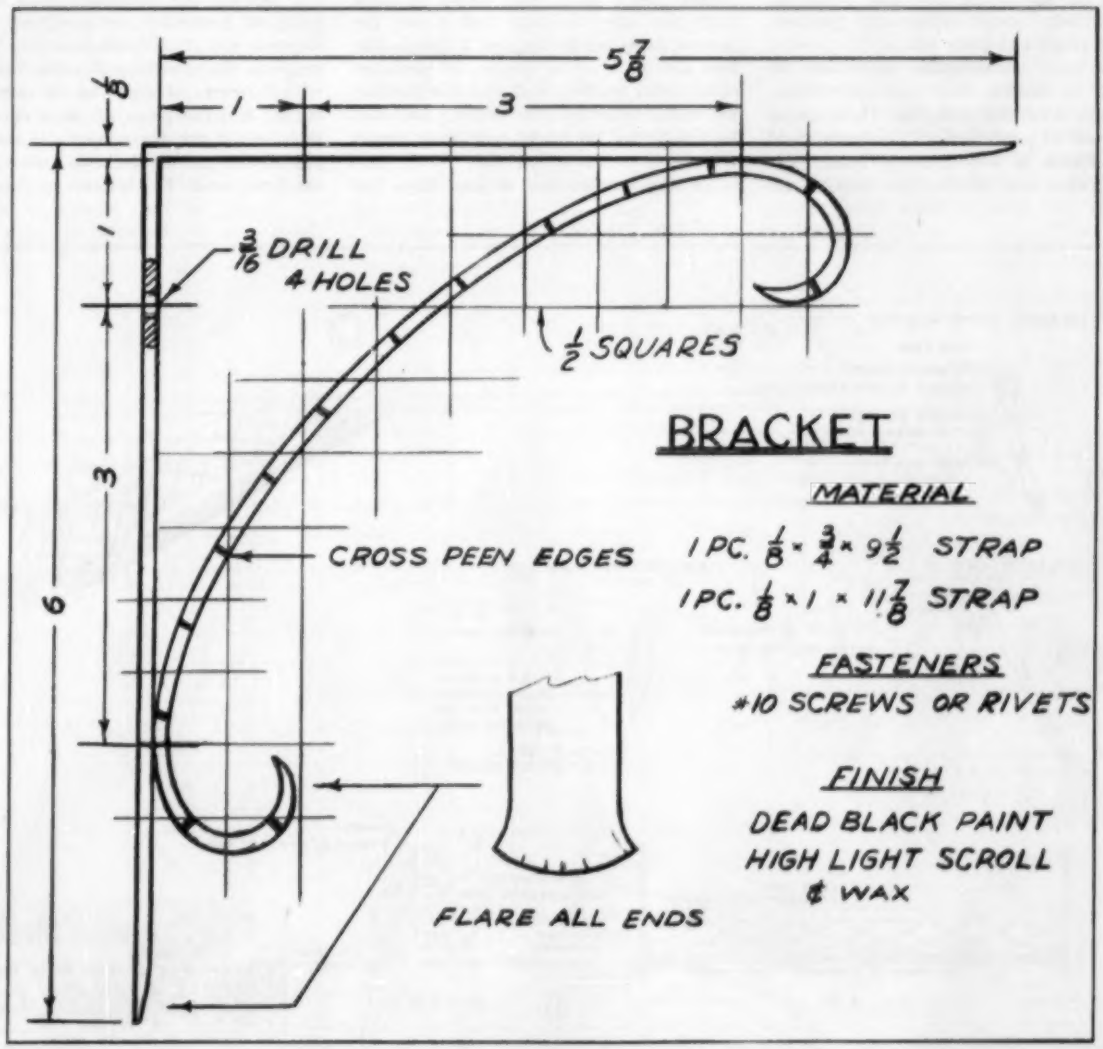
Procedure

1. Cut both pieces to length indicated and flare all ends.
2. Lay out bend and holes on bracket.
3. Drill holes and bend to 90 deg.
4. Form scroll and check with full size layout.
5. Locate holes and drill.
6. Cross-peen edges of scroll only.
7. Paint both pieces with dead black lacquer.
8. Highlight scroll and wax both pieces.

MODERNISTIC CRACKER TRAY

CARL W. GOHR, JR.
Industrial Education Dept.
University of Maryland
College Park, Md.

The modernistic cracker tray removes the cracker bowl or that unsightly cracker box from the dining table and replaces it with an efficient as well as decorative cracker server. The cracker tray is not only



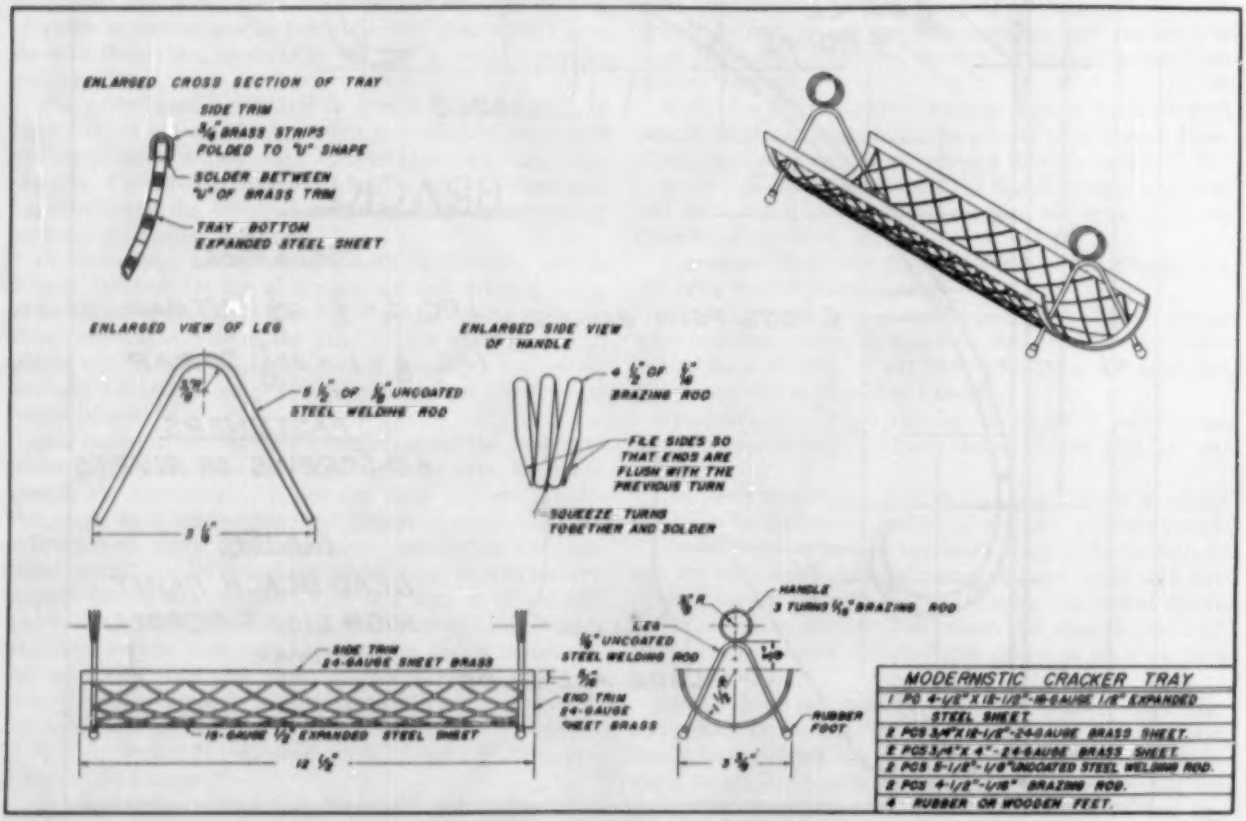
Detail drawing of the wrought iron bracket

Modernistic cracker tray

useful on the dining table but makes an *eye-catching* party server for pretzels, potato chips, and other snacks.

The basic metalworking operations involved in making the tray are cutting, bending, filing, and soldering. These operations can be performed with common hand tools found in almost every home. The tray makes use of the now popular expanded metal along with strips of brass that not only decorate but cover the uneven edges of the expanded metal. The legs are made of a section of uncoated ⅛-in. steel welding rod and the handles are make from 1/16-in. brazing rod. The legs also may be made from coat hanger wire.

To start construction of your tray, first cut a 4½ by 12½-in. piece of 18-gauge, ½-in. expanded steel sheet. Have the diamond shaped holes run lengthwise of the tray. A variation of this tray could be obtained by using sheet metal rather than the expanded metal. This constitutes the bottom of the tray. Bend the bottom of the tray into an arc having a 3-in. diameter. This operation can be performed on the forming rolls, or, the material can be pressed, with the hands, around a section of iron pipe or stake until the proper arc has been formed. *Wear gloves when pressing the metal around the piece of pipe; some of the edges may be sharp.* After the bottom is shaped, start on the brass trim. From 24-gauge brass cut four strips: two pieces ¾ by 12½ in., and two pieces ¾ by 4 in. Bend the brass strips through their long axis on a bar folder so that the finished pieces, which are shaped like a *U*, will fit over the edges of the expanded metal. The brass strips can also be bent by placing 5/16 in. of the strip between two pieces of hardwood in a vise and bending the remainder, with another piece of hardwood, to a 90-deg. angle. Remove the strip from the vise, lay the strip on the bench and force the strip, with the piece of wood, to the required *U* shape. A scrap piece of sheet metal the thickness of the expanded metal should be placed over part of the strip before making the final bend. This allows an opening in


ENLARGED CROSS SECTION OF TRAY
SIDE TRIM
¾" BRASS STRIPS FOLDED TO "U" SHAPE
SOLDER BETWEEN "U" OF BRASS TRIM
TRAY BOTTOM EXPANDED STEEL SHEET
ENLARGED VIEW OF LEG
5½" OF ⅛" UNCOATED STEEL WELDING ROD
3 ½"
ENLARGED SIDE VIEW OF HANDLE
4 ½" OF 1/16" BRAZING ROD
FILE SIDES SO THAT ENDS ARE FLUSH WITH THE PREVIOUS TURN
SQUEEZE TURNS TOGETHER AND SOLDER
SIDE TRIM 24-GAUGE SHEET BRASS
19-GAUGE ½" EXPANDED STEEL SHEET
12 ½"
⅛" UNCOATED STEEL WELDING ROD
END TRIM 24-GAUGE SHEET BRASS
HANDLE 3 TURNS 1/16" BRAZING ROD
LEG
RUBBER FOOT
3 ⅜"
MODERNISTIC CRACKER TRAY
1 PC 4-1/2" X 12-1/2"-18 GAUGE 1/2" EXPANDED STEEL SHEET
2 PCS 3/4" X 12-1/2"-24 GAUGE BRASS SHEET
2 PCS 3/4" X 4"-24 GAUGE BRASS SHEET
2 PCS 5-1/2"-1/8" UNCOATED STEEL WELDING ROD
2 PCS 4-1/2"-1/16" BRAZING ROD
4 RUBBER OR WOODEN FEET

Details of the modernistic cracker server

the *U* for the expanded metal. When bending the brass trim for the ends of the tray in an arc place scraps of sheet metal in the *U* so that the strip will not be flattened in the process. Place the long brass strips on the sides of the tray and solder by heating small sections and letting the solder melt into the *U* of the brass trim. A soldering copper, a torch, or even a bunsen burner can be used to solder the trim to the edges of the tray. After attaching the side trim file the ends of the end trim so that they fit snuggly between the side trim. Attach the end trim in the same manner that the side trim was attached. Cut two pieces, for legs, 5½ in. in length from uncoated steel welding rod or coat hanger wire. Bend the legs, at the middle of the 5½ in. piece, around a piece of ¾-in. pipe until the feet are 2¼ in. apart. Insert the legs through the expanded metal. After inserting the legs through the bottom spread them until the feet are 3 in. apart. Solder the legs to the expanded metal. The handles are made of three turns of 1/16-in. brazing rod. The brazing rod or brass wire is wrapped around a ¾-in. pipe. The three turns of wire are soldered together where the two ends meet. These are then soldered to the top of the legs. Rubber feet, that can be purchased in most hardware stores, are added to the bottom of the legs to prevent marring the furniture. Pieces of ¼-in. dowel could also be used for feet.

The brass is rubbed to a high polish with fine steel wool and then given a coat of clear lacquer to prevent tarnishing. The expanded metal is finished with two coats of flat-black lacquer or enamel. As an added attraction a piece of bright colored cloth 4 by 11½ in., can be placed in the bottom of the tray.

PISTOL-CROSSBOW

E. MILTON GRASSELL
School Specialist in Visual Instruction
Oregon State System of Higher Education (Formerly an Industrial Arts Instructor)
Corvallis, Ore.
and
CHESTER STEVENSON
(Formerly Instructor)
Eugene, Ore.

Photos by Francis R. Schultz

Though small in size, this unique pistol-crossbow has plenty of power for precision target shooting and is capable of killing small game. Yet, it is much easier to cock and handle than the more conventional full-scale crossbows.

No special technical archery knowledge is needed, and besides, you'll find that the students will enjoy making this clever crossbow and at the same time will be learning basic skills.

Coauthor, Chester Stevenson, demonstrates certain construction phases and proper use of the completed project in the accompanying photographs.

The Stock: The stock includes the barrel and the pistol-grip handle. The general design can be modified to suit individual taste as long as the draw (distance from the back of the bow to the trigger unit) isn't changed.

One-quarter inch thick aluminum, bronze, brass, or industrial fiber makes a fine trigger release latch. Any of these materials can be cut with a hacksaw and filed to shape if a metal cutting bandsaw isn't available.

The trigger release latch rotates on a ⅛-in. diameter welding rod. Two decorative upholstery tacks driven in the stock camouflage the welding rod ends.

The Bow: This powerful laminated bow has two time-saving features: (1) no steaming is needed and (2) no tillering is necessary if the stock is cut according to J and K in Figure 3a.

Be sure to use a glue situable for laminated bow construction such as Cascophen or URAC-85. Strips, about 1 in. thick cut from a discarded inner tube, are excellent for holding the laminated pieces under pressure while the glue is drying.

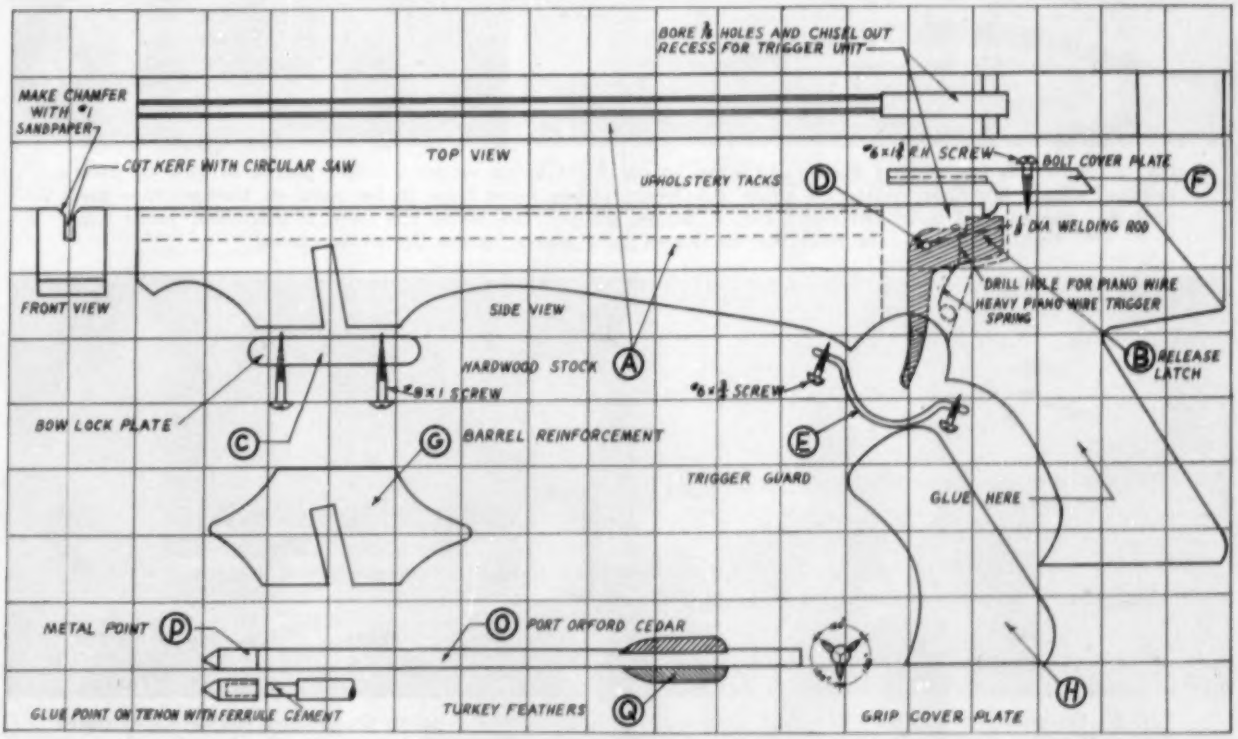


Fig. 2A. Details of stock and bolts

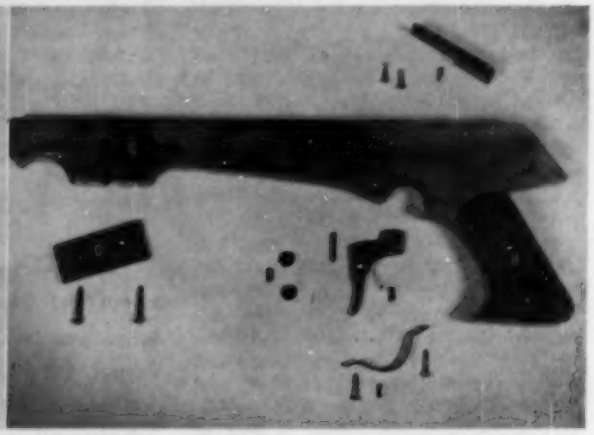


Fig. 1. This unique pistol-crossbow is excellent for hunting small game and extremely accurate for target shooting. (At right) Fig. 2. You may be able to find most of the material in your basement or workshop

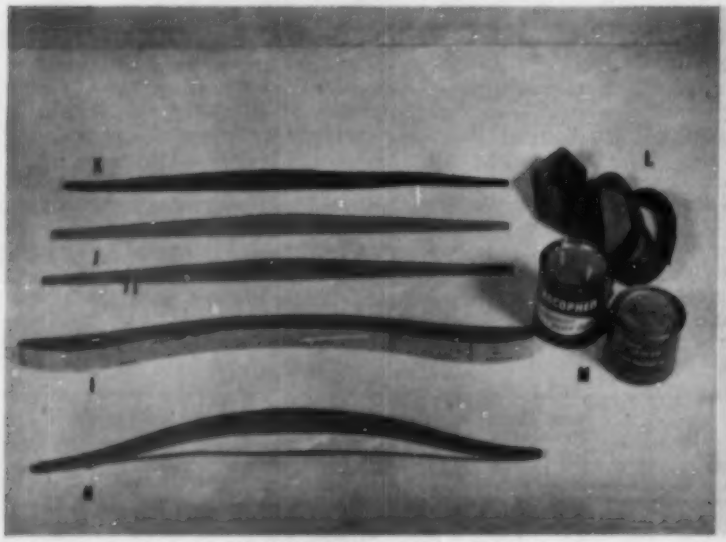


Fig. 3. Materials for making the bow: I – the jig cut from scrap wood; J – two pieces of yew or osage orange wood; K – fiber glass; L – strips cut from rubber inner tube to be used as clamps; M– glue; and N – the finished bow. (At right) Fig. 4. Strips, about 1 in. wide cut from a discarded inner tube, are used to hold the laminated bow pieces to the jig while gluing

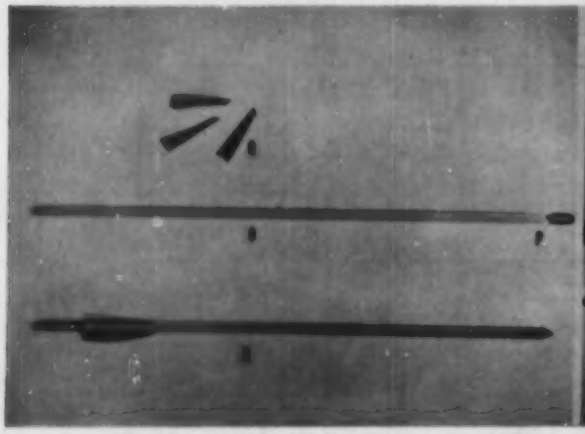


Fig. 5. Materials for the bolt: O – Port Orford cedar bolt shaft; P – point; Q – turkey feathers. (At right) Fig. 6. Fletching (putting feathers on the arrow shaft) can be done with inexpensive fletching jigs that sell for about $1.50 up. Duco Cement will hold the turkey feathers in place

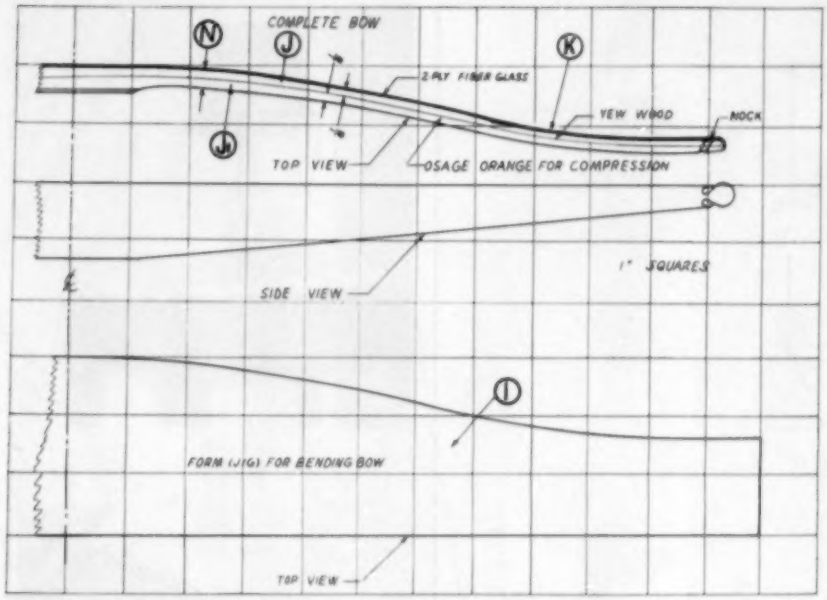


Fig. 3A. Details of the bow

The Bolts (arrows): By ordering parts for the bolts from archery supply houses, the amount of special equipment required can be reduced. Also, ask for shafts with tenons already cut. Metal points are slipped over the tenons and glued with ferrule cement.

After lacquering the shafts, cut the turkey feathers with scissors (see drawing for size), and glue them to the shafts with Duco cement. An inexpensive fletching jig (on the market from about $1.50 up) is worth the price when you get to making the bolts.

BILL OF MATERIALS

Code	No. of Pcs.	Material	Size
The Stock:			
A	1	Hardwood stock including "barrel"	1 x 5½ x 17
B	1	Aluminum, fiber, or bronze release latch	¼ x 1½ x 3
C	1	Hardwood bow lock plate	½ x 1 x 2½
D	2	Upholstery tacks to cover up ends of ⅛-in. shaft that trigger rotates on	
E	1	Brass trigger guard	16-ga. ⅜ x 3½
F	1	Bolt cover plate	⅜ x 1 x 3¼
G	2	Barrel reinforcement at weakest part of crossbow	3/16 x 1¾ x 4
H	2	Grip cover plate	3/16 x 3 x 3¾
The Laminated Bow:			
I	1	Jig for forming bow	1½ x 3 x 74
J	1	Yew wood	⅛ x 1¼ x 24
J_1	1	Osage orange	⅛ x 1¼ x 24
K	1	Fiberglas	2-ply 1½ x 24
L		Clamps for gluing	1-in. strips cut from discarded inner tube
M		Cascophen or URAC-85 glue	
N		(Shows finished bow in Figure 3). Measure from nock to nock and order bow string	
The Bolts:			
O	1 per bolt	Port Orford cedar	5/16 dia. x 9
P	1 per bolt	Metal points	
Q	(One feather will fletch more than one bolt)	Turkey feathers	

DESK TOPS OF TEMPERED PRESDWOOD

For science desk tops, Masonite ¼-in. Tempered Presdwood is a recommended surface material that is sufficiently resistant to chemical reagents when treated with a penetrating sealer, according to the engineering department of Masonite Corporation.

Laboratory bench tops of this material, when strong chemical reagents such as 2N sodium hydroxide and 2N nitric acid may be spilled, should be protected by Glidden Hardener or its equivalent.

SILENT BUTLER

HAROLD V. JOHNSON
Senior High School
Canton, Ill.

A silent butler makes an interesting project for students to make in the metalworking shop.

It is primarily a metal spinning project. However, it has some other operations that are of value to the students who are making this particular project.

Procedure

Bottom

1. Turn a chuck from hard maple or some other hardwood.
2. Sand smooth.
3. Cut a circular disk from copper, brass, or aluminum. If spinning aluminum use 20-ga. material. If using copper or brass do not use too heavy a material as it will increase the difficulties in spinning.
4. Mount the disk on the chuck in the spinning lathe.
5. Center and lubricate the disk.
6. Spin the disk over the chuck.
7. Trim the edge.
8. Polish.

NOTE. If the metal becomes hard while spinning remove from lathe and anneal. Copper and brass may be annealed by heating the metal so that it is hot enough to char a piece of pine wood. Then plunge the metal into cold water.

Lid

1. Turn chuck for the lid.
2. Turn a follow block for same.
3. Spin the metal to the chuck.
4. Polish.

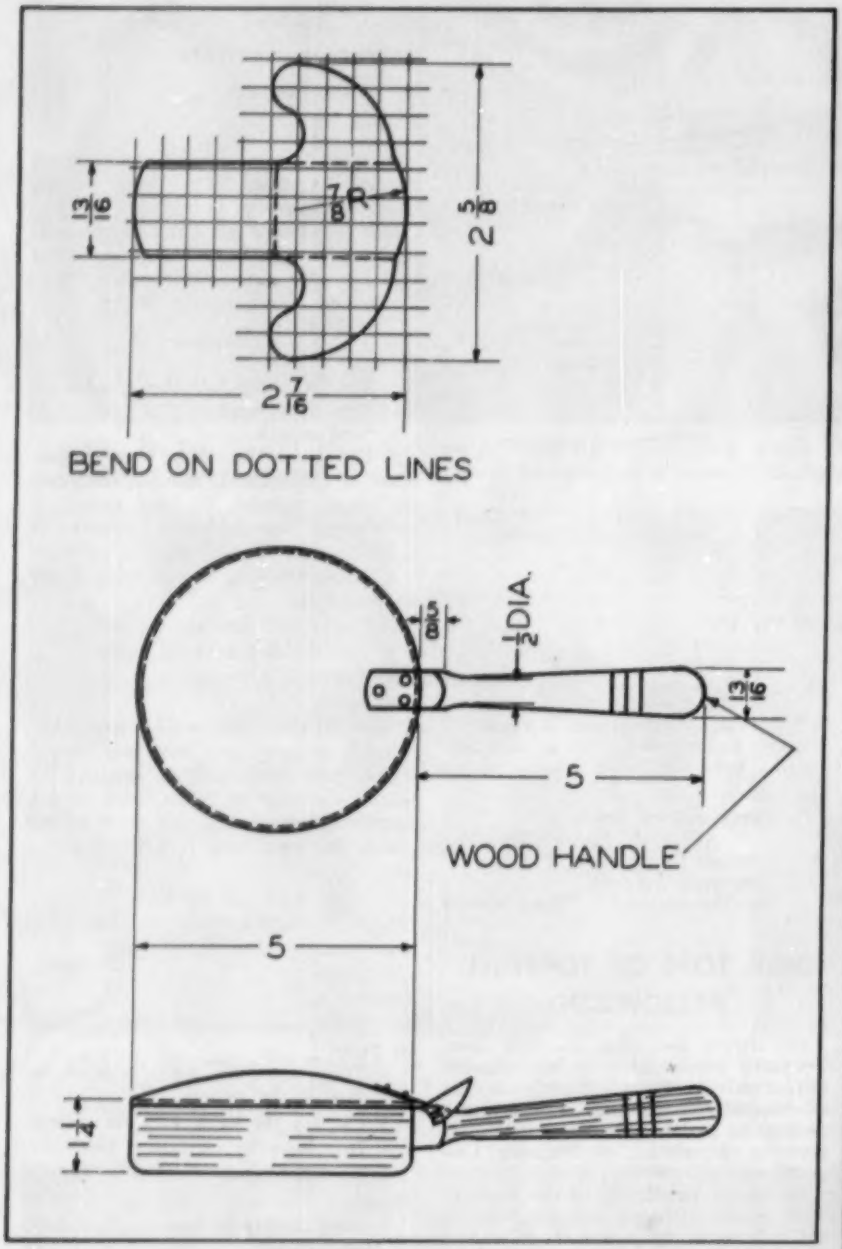
Hinge

1. Make a full size layout of the hinge on paper.
2. Trace upon the metal selected for this part of the project.
3. Cut out the blank with tin snips.
4. Drill holes for escutcheon pins.
5. Bend to shape.

Handle

1. Turn the handle from maple, walnut, or birch.
2. Finish handle as desired.

The finished project



Details of the silent butler

3. Fasten handle to the bottom with small screws and the handle to the hinge with escutcheon pins.

4. Spray project with clear lacquer to prevent tarnishing.

ADJUSTABLE TABLE, DESK OR BED LAMP

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Boston, Massachusetts

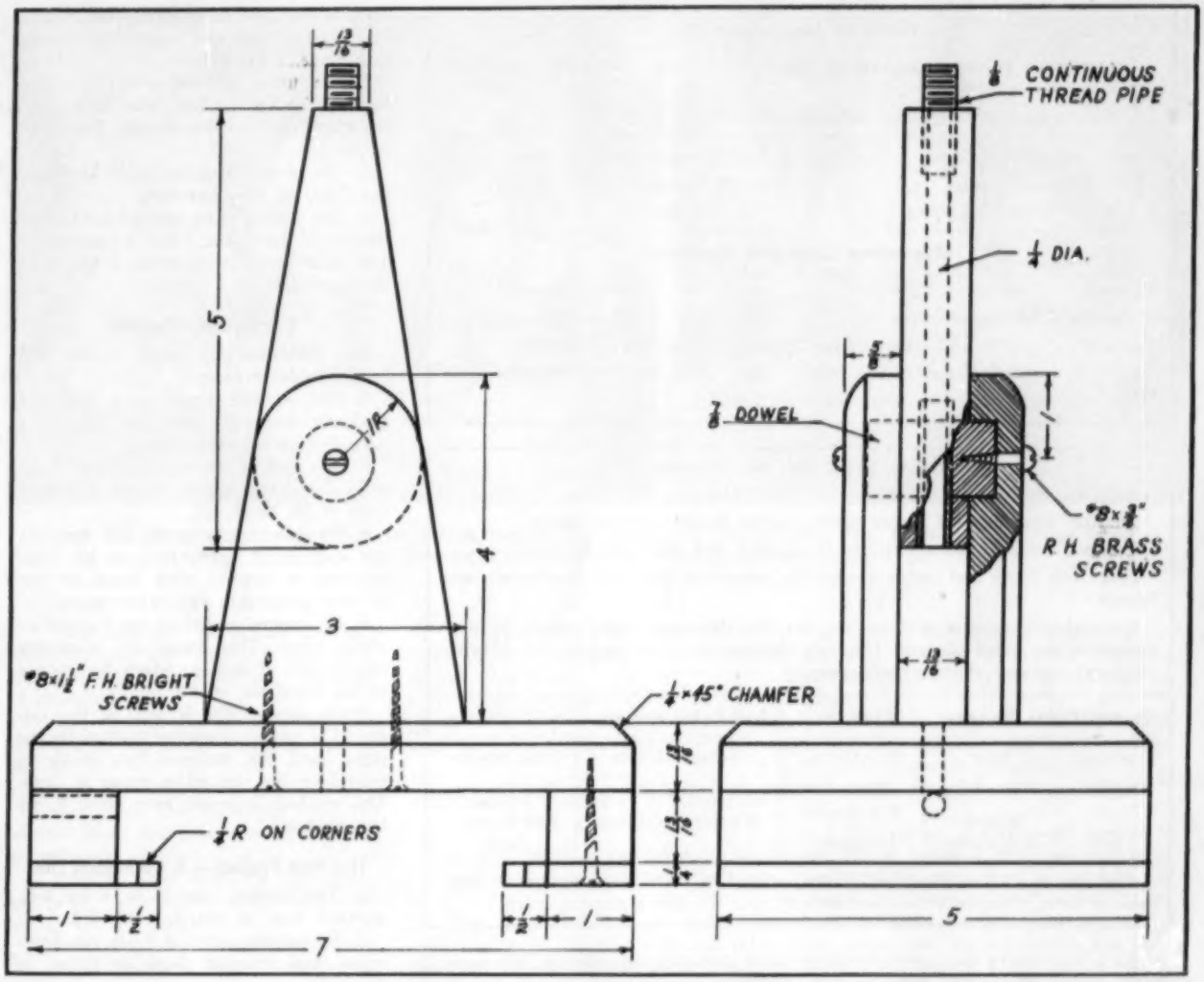
This versatile lamp was designed originally to hang on one of the back stretchers of an army-type bunk bed. However, the movable arm allowed the lamp to become easily adaptable to many other uses. It has been used with success as a desk lamp, a bed lamp and, in its upright position, as a small table lamp.

The project is not beyond the ability of an average eighth grader. Although the original was made of maple, some softer wood would prove satisfactory and easier to work.

The uniqueness of the lamp lies in its movable arm. The upper part of the arm

Adjustable lamp for table, desk, or bed

contains a friction fit, small brass pipe on which the socket is mounted. The lower part, through which a ⅞-in. dowel is inserted, also contains a friction fit, small pipe to prevent the dowel from loosening and pinching the wire. The uprights which support the movable arm are to be bored to accommodate a ⅞-in. dowel with a No. 14 auger bit before any shaping has been done on them. The boring will be greatly facilitated if both uprights are cut out of the same piece of wood and



Detail drawing of the adjustable lamp

left in its squared form for this step. It is recommended that the dowel fit snugly in the holes bored in the upright. If this is not obtained, small brads nailed through the top of the uprights, with their points scraping the dowel, will provide all the friction that is necessary to keep the arm in position.

The author made use of an antique tan stain, commonly used to stain leather, on the original maple project. This was applied and promptly rubbed off to give an even finish that revealed the grain of the maple wood. A rubdown with wax completed the finish of the lamp.

BEGINNING PLASTIC WORK — COLORFUL TILES MADE WITH LIQUID PLASTICS

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This is recommended as a beginning project in the combination materials section of the woodshop course, as described in the September issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

The time to begin with plastics, many think, should follow after the first wood project. At that point, new ideas are welcome, and new materials challenge the thought.

Organizing the First Shop Experiment — Combining Liquid Plastic With Wood

Dividing the work

1. Appoint a student chairman.
2. Outline his duties.
3. Let him read the project directions in advance of the class.
4. Help him plan the conduct of the experiment.
5. Assign two assistants.
6. Call attention to the need for economy in use of materials. Explain the manner of dividing expenses among the students.
7. Impress upon them the importance of neatness. Insist that the shop be cleaned up and everything returned to its place at the close of each session.

So that this may be a valuable lesson in laboratory organization and management, students are given special duties within their capabilities. Rotate these responsibilities where practical. The teacher load is thus considerably lightened, and he will have time to watch and to advise.

Preliminary Assignments

1. The student cuts and sands a ¼ by 6 by 8-in. piece of plywood for his base piece.
2. Each student must also cut 6 pieces of 1/16-in. dia. by 6½-in. brass wire.
3. He places these on his board in various positions until he arrives at a suitable design. See Figure 3.
4. Direct him to cut off overlapping ends and crossing wires. All wires should lie flat on the board.

Table of Measurements

Use standard kitchen measuring spoons and measuring cup. These cost little and are available everywhere.

Use glass medicine dropper to measure hardener.

3 teaspoons = 1 tablespoon	1 kitchen cup = 9 ounces resin
2 tablespoons = 1 ounce	1 pound Castoglas = 1¾ cups
1 3-oz. paper cup = 3 ounces	1 cup = ½ pint

Measuring Castoglas Hardener

To harden 1 teaspoonful Castoglas	use 5 to 10 drops hardener.
To harden 1 tablespoonful (½ oz.)	use 10 to 20 drops hardener.
To harden 3 ounces (6 tablespoonfuls)	use ¼ teaspoonful hardener.
To harden 1 pound Castoglas (1¾ cups)	use 2 teaspoonfuls hardener.

These amounts harden Castoglas within 30 minutes.

Color Table for Tile Projects

Each tile requires 3 related colors.

For the beginning, use nature colors: spring shades and fall shades.

Use one dominant color, less for the second, and least for the third.

Spot both forms and colors so that the completed piece has spontaneity and balance.

Color shades, even of a single hue, may be pleasingly varied merely by proportioning the added pigment. They are also grayed or softened by the addition of a slight amount of an opposite primary.

Spring Color Ranges (*Examples*)			**Fall Color Ranges** (*Read Vertically*)	
Dominant	Blue	Blue-Green	Tobacco-Brown	Dark Brown
Second	White-Blue	Whitish-Blue-Green	Dark Red-Brown	Red-Brown
Third	White-Blue-Green	Turquoise	Whitish Red-Brown	Red-Brown-Gold

Mixtures of gold or silver with colors, or gold or silver alone, though in small relative areas, with the above combinations, give the tiles a pleasing spark.

5. Each boy selects his own three-color scheme within the range given in the Color Table.

Division of Labor

To get the tile casting started with the least complication, arrange the work as follows:

1. The chairman, at the beginning of the experiment, pours all liquid resin as each boy comes up. He may assign another student to do this pouring later. The one thus pouring estimates the amount of resin required, and separately supplies each student. See Figure 1.

2. The first assistant adds the color required by the student, who makes his selection from a color sample. See color table.

3. The second assistant adds hardener. See Table of Measurements.

4. The student mixes his allotment as he returns to his table. Then he pours his first color into the brass-bound spaces of his baseboard.

Conserving Plastics

The chairman may decide to use this procedure for economy:

1. Pour enough liquid resin into the student's measuring cup for his entire job: say for example, blue.

2. The student immediately pours some of this into two spaces on left and right sides of his baseboard.

3. He then returns to the first assistant for a pinch of green to tone his blue, resulting in peacock blue. Some of this he now pours into two other spaces.

4. He returns as before for a pinch of white color. This turns his remaining plastic into turquoise, which he applies to his remaining spaces.

What plastic still is left in the cup should be passed to another student. On the other hand, the chairman may decide to pour blue for the entire group at once. This method, however, may prove to be less creative.

The First Project — A Coffeepot Tile

1. The student cuts ¼ by 6 by 8-in. plywood base as already explained.

2. He cuts six pieces of 3/16-in. dia. brass wires, and arranges them as shown in Figure 3.

3. He need not fix them to the board unless he prefers to do so with glue. It is important that the pieces lie flat on the board, in either case.

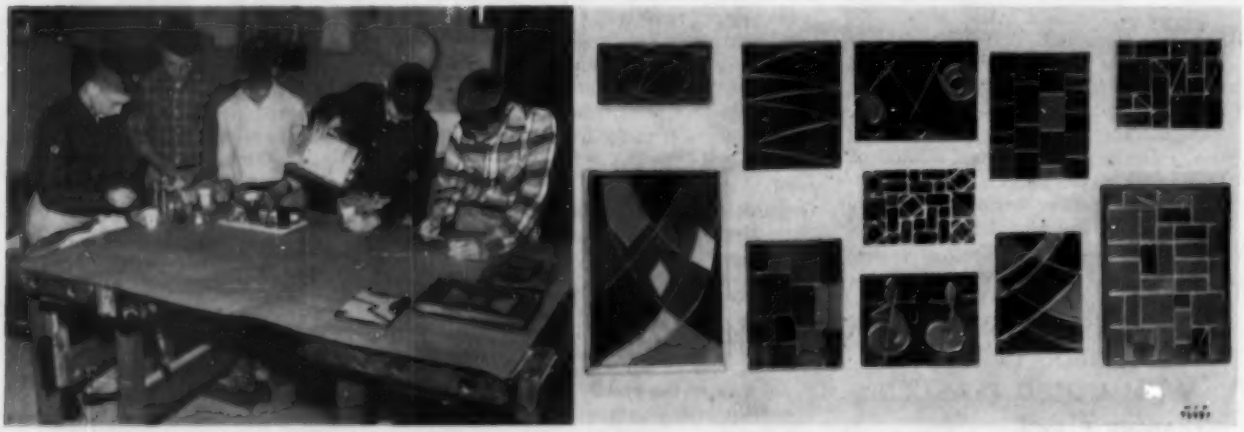

Fig. 1. Class chairman pouring liquid Castoglas, and his assistant coloring and catalyzing the resin for their classmates to use on tile projects. Fig. 2 (at right). A few of many colored tile coffee-pot stands, trays, and letter files made with great enthusiasm by seventh grade boys

Fig. 3. Arranging brass wire to create design for coffee-pot tile projects. Fig. 4 (at right). Junior high school boys pouring colored Castoglas into brass-wire-lined spaces on tiles

4. The chairman pours the student's Castoglas; the first assistant adds color; and the second assistant adds hardener, as explained.

5. The student stirs his chemicals, and returning to his bench, he pours some of the mixture into two brass wire-bound spaces on his tile board. See Figure 4.

6. He tones the remaining resin to another shade, and pours two more spaces, as previously outlined.

7. Then he tones down his color again, and pours the remaining spaces, thus completing his tile design.

8. When hard, he covers the edges of the project with a newly mixed dark shade, rounding the edges up as high as the plastic will take it.

9. He cuts four ½-in. lengths of ½-in. dowel for feet. These are cemented to the bottom with plastic.

10. When completely hard, the tile is polished by hand with AAA compound used on a coarse cloth pad.

The Second Project — A Flowerpot Tile

This work requires careful space division and good color judgment. See color table.

1. The student should cut ¼-in. plywood into strips $1\frac{5}{16}$ in. wide, and recut these into $1\frac{5}{16}$-in. lengths, using a miter-box as shown in Figure 6, until he has 24 or more pieces. A few of these he may cut into halves, making small squares; and two or three he can cut diagonally into halves to make triangles. Sand all edges.

2. These he may sort into color piles to give him dominant and related proportions mentioned in the color table. Spread the pieces ready to coat, as shown in Figure 7.

3. The plastic is mixed and applied to one pile at a time in the same manner as explained for project 1. At the end, the student has three piles of colored pieces, each pile having varied shaped pieces, one pile large, and the others medium and small. See Figure 8.

4. These he arranges on a space the size of his board. He tries many ways,

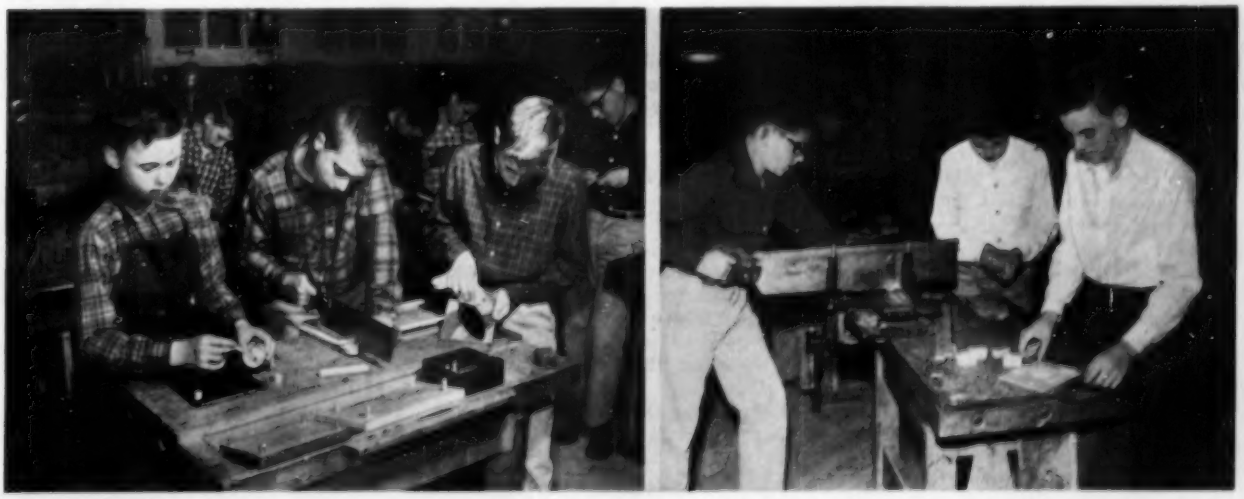

Fig. 5. Cutting and applying feet to the bottoms of tile projects. Fig. 6 (at right). Seventh-grade students cutting small pieces of plywood to be coated with plastics for flowerpot tiles

Fig. 7. Deciding on color schemes and relative color proportions. Fig 8 (at right). Pouring colored Castoglas on components of their flowerpot tile projects

working toward interest and balance in both piece arrangement and color.

5. With fresh Castoglas over the entire baseboard, he then sets his pieces into their places. The pieces are set approximately 1/16 in. apart. See Figure 8.

6. Interstices should be filled with a thin mixture of tinted plaster-of-Paris, wiped immediately dry and clean; or, better, fill with Castoglas mixture which is immediately wiped with toweling and then with cleaner in a cloth. Treat edges and finish as in Project 1.

Apply the given procedures to a broad variety of shop projects.

Many open surfaces on small projects such as coffee-pot stands, plant stands, lamp bases, box tops, trays, letter files, book ends, small table tops, etc., may be creatively treated by the processes explained in this article. Thus, wood items may be built in the usual way, and the plastic experience added later. This comes at a time in the semester when the shop is already well organized, and new experiences are an advantage to all.

The plastic treatment of coffee and plant table tops and all tray tops is a practical solution for all moisture or alcohol problems. Entire tops may be made of tile; or otherwise, color sections may be set into wood tops.

Further Suggestions

1. Marks left on the top surfaces of wood baseboards or table tops show through translucent plastic sections. Therefore, it is important that surfaces are clean before plastic is poured on them.

2. Just enough plastic color should be added to the mixture to produce an opaque cover; too much color causes tackiness in the final surface.

3. There is wide latitude in the use of hardener; and of course, this is fortunate for the teacher as well as for the young chemist; too much hardener gels the batch in ten minutes, which may be too soon for careful application of Castoglas to the job. Too little hardener merely prolongs the setting period, sometimes to as long as 24 to 30 hours. The amount of hardener in proportion to Castoglas, given in the Table of Measurements should gel the resin within 20 to 30 minutes; a good working time.

4. Inadequate mixing after the addition of hardener may cause uneven or lumpy gelation, or even failure in spots. Thorough mixing is required.

5. Late pouring, that is, pouring at the moment of gelation, results in rough work that needs to be removed and re-done.

6. Fill small tiles to such depth as will round up well at edges.

7. On tiles with wire separations like those in Project 1, plastic should be poured not to rise wholly to the top of the wires. Wires must remain definitely above the level of the finished plastic to be part of the design.

8. In coating the outer edge of a project such as a tile, the edges being very narrow, careful application will avoid dripping over. Careless work necessitates tedious refinishing of the run-over area.

9. Coated secondary members of a project such as the wings of a book stall, the frame of a tray, or coated bottoms, if any have been so treated, make attractive additions to an already fine project.

10. Used mixing cups that are dry and smooth may be re-used, but avoid cups with wet color that might discolor the new mixture.

11. Avoid also any contamination of the paste color in its jar with other color. Sticks used for the dispensing of color must be wiped clean after each use. Avoid laying down anything wet, even temporarily. Wipe everything dry and clean.

12. Keep hands as clean as possible. This means, keep plastic from running down the outside of cups, keep resin can and spout wiped, keep medicine dropper emptied and in its own place, etc. Hands should be washed frequently in mechanics soap or kitchen cleanser.

13. Wherever possible, use disposable material as this outline suggests again and again. Use paper on all work areas; use paper measuring cups and wood stirring sticks; and use paper toweling and waste cloth wipers. In the place of paint brushes, use small 2 by 2-in. cardboard squares, torn to present a soft feather edge.

14. If brushes are used, they are best cleaned in Castoglas brush cleaner. Use mechanics soap or kitchen cleanser as alternatives; but of course, all brush cleaning must be done immediately; i.e., before the plastic hardens.

15. Wear protection for good clothes. Plastic spots must be removed before the resin hardens with brush cleaner and strong soap. In our experience, there has been little clothes spotting, even in large groups.

16. If because of failure for any of the given reasons the hardened surface is too rough for other means of correction, it may be chipped out with a chisel, 1/16 in. at a time, and recast. If possible, it should have been taken out with a putty knife or sharp chisel just after gelation when it was still quite soft. If the roughness is below surface level, or if it may be sanded down, a corrective coating may be run over it.

17. In all additions of second coatings over Castoglas, the undercoat should be thoroughly roughened with sandpaper before covering.

18. If the liquid resin is poured at the moment of gelation, the coating will be irregular and lumpy. Remove the section immediately with a chisel. In its

rubber-like state it can be cleaned out completely, and much time will be saved if the job is re-done.

19. When there are slight irregularities, surround the section with masking tape, file the roughness down and sand the spot with rough, medium, and very fine (400 grit) water sandpaper; then buff as below.

20. A professional finish can be produced by hand buffing. After spot sanding, as above, pour a small amount of buffing compound over the surface and rub with a small square of coarse fabric such as canvas or denim. Much hand and thumb pressure is needed. The bar of compound can also be rubbed over the tile previous to the rubbing. When uniformly polished, clean off with kerosene and then soap, applied with a brush.

STOP WASTING GLUE

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Student
Indiana State Teachers College
Terre Haute, Ind.

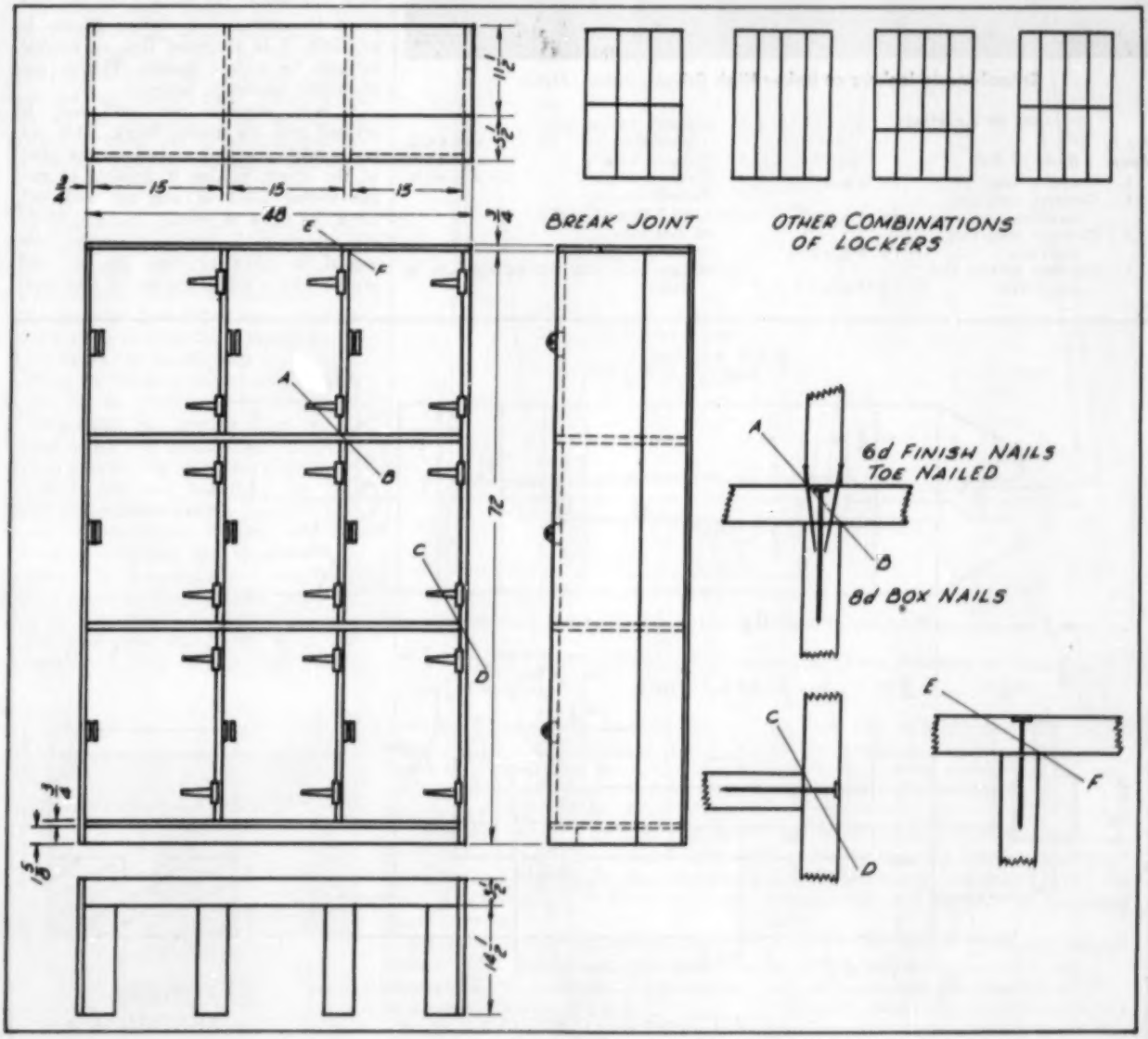
Here's a good way for shop teachers to curb the ever present problem of wasting expensive liquid glue. Purchase two or three flexible plastic catsup or mustard containers, fill them with liquid glue, and squirt the glue in the joints like catsup is squirted onto a sandwich.

SCHOOL-MADE LOCKERS

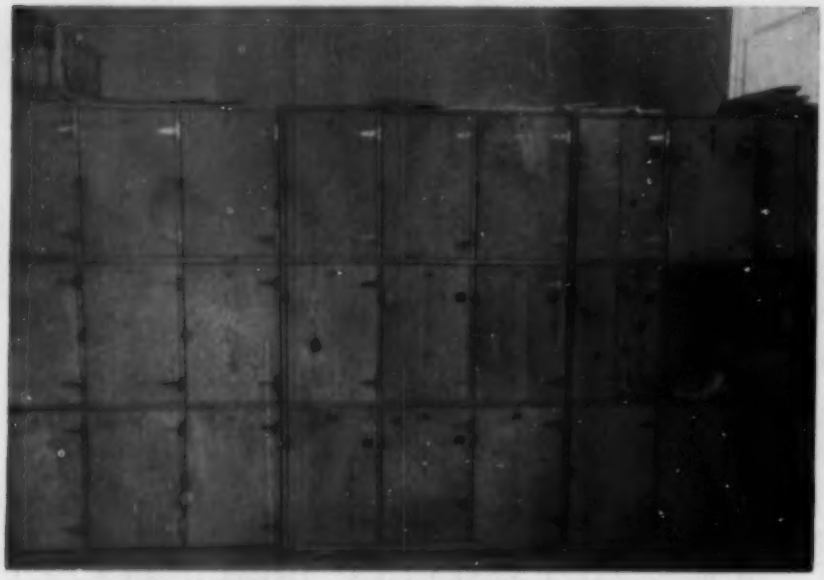
LEONARD HASKELL
Shop Instructor
High School
Baker, Mont.

The accompanying drawing shows how lockers were built in the industrial-arts shop at Baker, Mont. The lockers are in sections 4 ft. wide so that ordinary plywood can be used for the doors and back with no waste of material.

Lumber and hardware were purchased locally. Including labor, the lockers were constructed quite economically at a substantial saving over the cost of metal lockers.



Arrangement of lockers in Baker, Mont., school shop



School-made lockers at Baker High School, Baker, Mont.

BILL OF MATERIALS

No. of Pieces	*Name of Part*	*Size*
1	Common base	2 x 4 in. x 9 ft.
4	Common sides and partitions	1 x 12 in. x 6 ft.
4	Common sides and partitions	1 x 6 in. x 6 ft.
4	Common bottom and top shelves	1 x 12 in. x 4 ft.
4	Common bottom and top shelves	1 x 6 in. x 4 ft.
1	Plywood back	¼ in. x 4 x 6 ft.
1	Plywood door	¾ x 4 in. x 6 ft.
9	Padlock eyes	
9 pr.	Light T hinges — 3 in.	
	8d Box nails	
	6d Finish nails	
	Shingle (4*d*) nails for nailing back in place	

MULTI-PURPOSE VISE

HERBERT W. YANKEE
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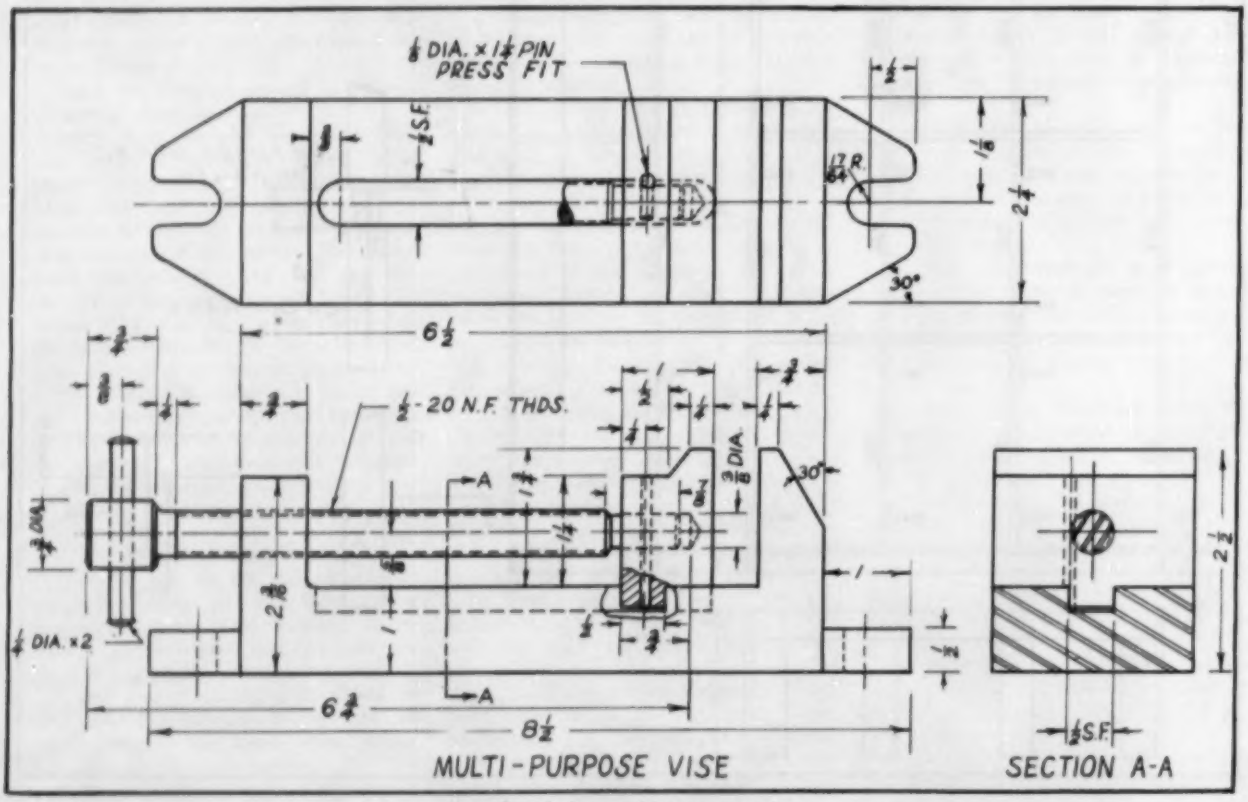
High School
Stratford, Conn.

This vise was designed for senior high school students. It has proved to be well within the ability of the average junior and senior high school pupil. Some projects, because of their many similar operations and the time taken to make them, become monotonous to pupils and teachers alike. This project is especially good because of the many learning units it presents and because of the comparative ease and speed with which it can be made. All the operations can be easily performed on just three machines: the lathe, the shaper (or miller), and the drill press. Of course, if a surface grinder is available, it is suggested that all outside surfaces be surface ground. This is not absolutely necessary, however.

A ⅜-in. diameter pin (drill rod) is pressed into the sliding block. This pin mates with a groove turned on the pilot of the screw, making it possible to run the sliding block in and out and still allow the screw to remain in place. While this operation is relatively simple, care should be taken to mate the pin and groove with a slight amount of clearance.



Details of the multi-purpose vise

The sliding block rides in a slot milled on the stationary block. This assures alignment of the two blocks which form the jaws of the vise. The pin in the large diameter of the screw should be inserted loosely and peened over on the ends after assembling in place.

Jaw faces made of brass ¼ by 1⅝ by 2¼ in. finished may be added to the vise. These can be fastened to the faces of the sliding block and to the stationary block by means of No. 10-24 NF by ½-in. f.h. machine screws.

SHEET METAL DESK LAMP

ARTHUR E. DAMERON

Senior High School

Galesburg, Ill.

Nowadays, much is being said and written about designing in the school shop. This subject presents a problem in two respects. First, many industrial-arts teachers feel that they do not know enough about the art of designing. The second and greater problem lies in leading students to employ their own initiative and ideas in the designing and fabricating of a project.

It is generally understood, however, that high school students, as a group, have not had experience and background sufficient to do a great deal with designing. But since we know how important a place designing plays in industry, it should not be neglected in the school shop.

When we design a school project there is one helpful thought to keep in mind. A very small per cent of items on the market today can be classed as one hundred per cent new. A 1956 model automobile is not new. Something has been added and something taken from the 1955 model to produce the so-called new car. The same procedure can be followed, if necessary, in designing school shop projects. A glance at things already made will give us many places to begin.

The sheet-metal desk lamp, which was designed and built in our high school sheet metal shop, lends itself in this respect. The boys are acquainted with desk lamps of many shapes and sizes. So the problem involved is not to make a thing entirely new but to make a few changes in an existing object. The lamp base, upright, and shade can be changed both in shape and materials and at the same time keep a well-constructed, pleasing, and balanced design.

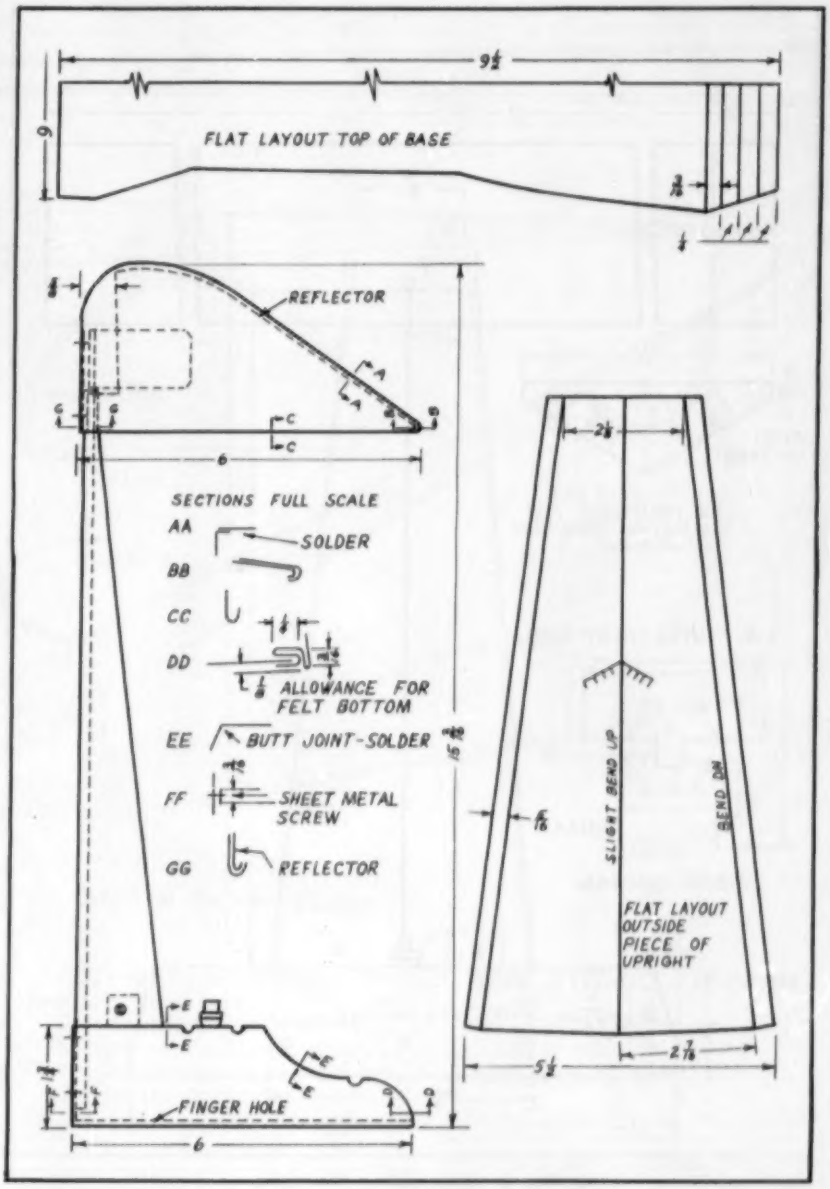
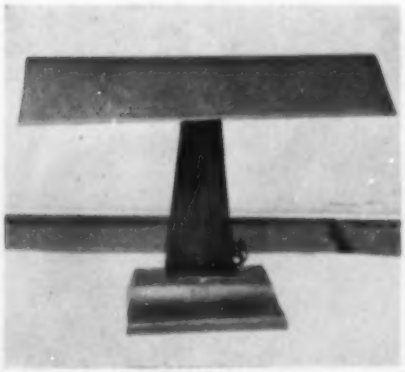


Fig. 1. Details of the upright and base of the sheet-metal lamp



Sheet-metal desk lamp

The lamp is also an interest holding project which draws upon the areas of sheet metal and electricity. It also serves as a useful take home project.

I use this procedure when helping the students choose and plan a project. First they answer the following questions, about the item they wish to make, with the aid of the instructor:

1. Is the project useful?
2. Where will it be used?
3. What will it cost?
4. What materials will serve best?
5. Do we have the necessary materials?
6. Is there any operation about the project that can't be done in the school shop?
7. Will the project teach you enough to justify making it?
8. Is it too large for our work area?

When a project is decided upon, the next step is to make a sketch or sketches as needed of the item. Full size sketches are used when possible since they show

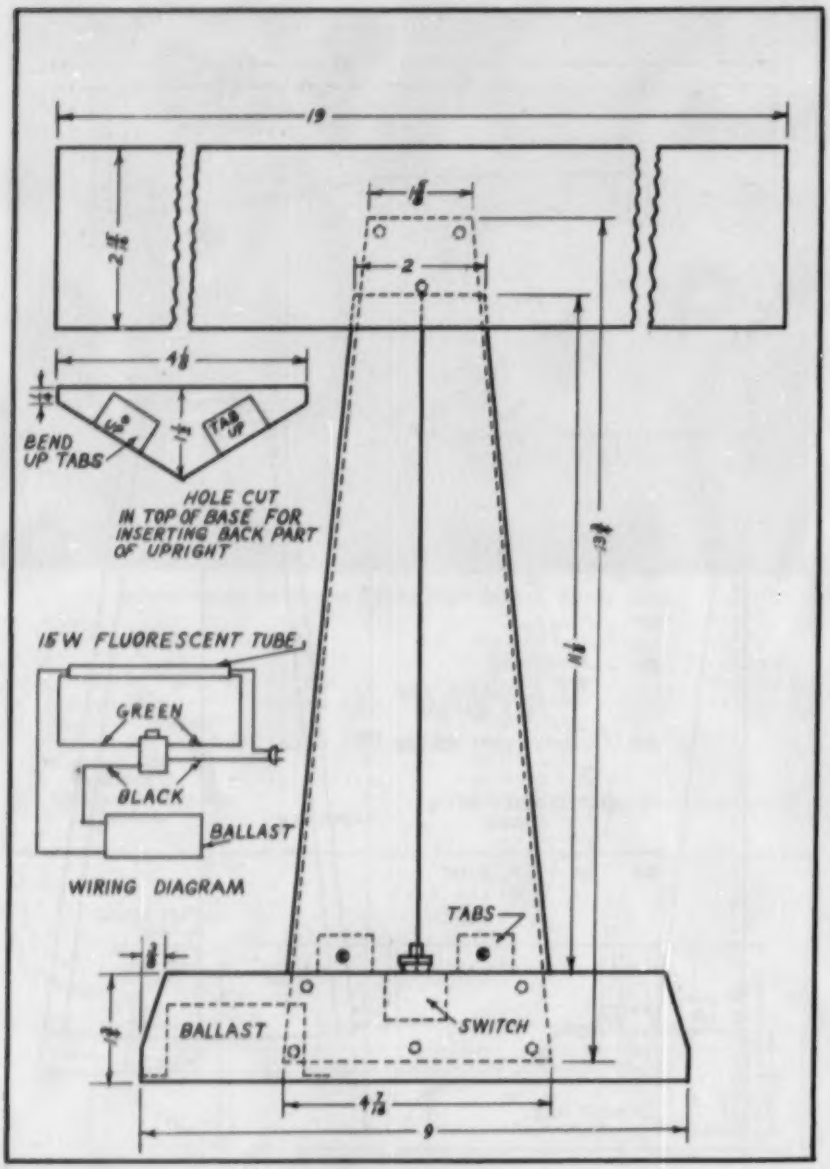


Fig. 2. Assembling the lamp

proportions more clearly than smaller sketches and also give the student a better idea of size.

The next step is to make a working drawing. Considerable time is taken for this, since the students know very little about working drawings and all shop teachers know the value of well-made plans.

To make working drawings and sheet-metal work more understandable, my beginning classes spend the first four to six weeks of the school year making small useful projects by following teacher demonstrations. In so doing the students get an over-all picture of sheet-metal work. They learn related information about materials, seams, edges, joints, allowances, fastening devices, etc., and how to use them in fabricating sheet-metal items. They also gain knowledge of the use of hand tools and machines and by this time their curiosity is satisfied, and they are ready to plan the project they want to make.

Getting back to the lamp, it may appear complex at first sight but becomes more simple when broken down into its components. The base is the most difficult piece and can be made in the following manner working from front to back:

1. Form the S on front part of base as shown by section *DD*, in Figure 1.
2. Curve metal to where first bead begins.
3. Form the bead.
4. Form the remaining curved area to the square bend.
5. Make the square bend.
6. Form the two top beads.
7. Make square bend on back.
8. Cut hole in top of base and bend up tabs.

The remainder of the forming is not difficult.

The finish we use is wrinkle paint which is sprayed on and baked in an oven. Wrinkle paint can be purchased in pressurized containers which is convenient since it eliminates the need for a spray gun. This paint has another advantage since it dries with the wrinkle finish without baking. The wiring should be done after the baking since the heat would damage the ballast.

TOO MUCH BUTTERING UP NO GOOD FOR CRUDE

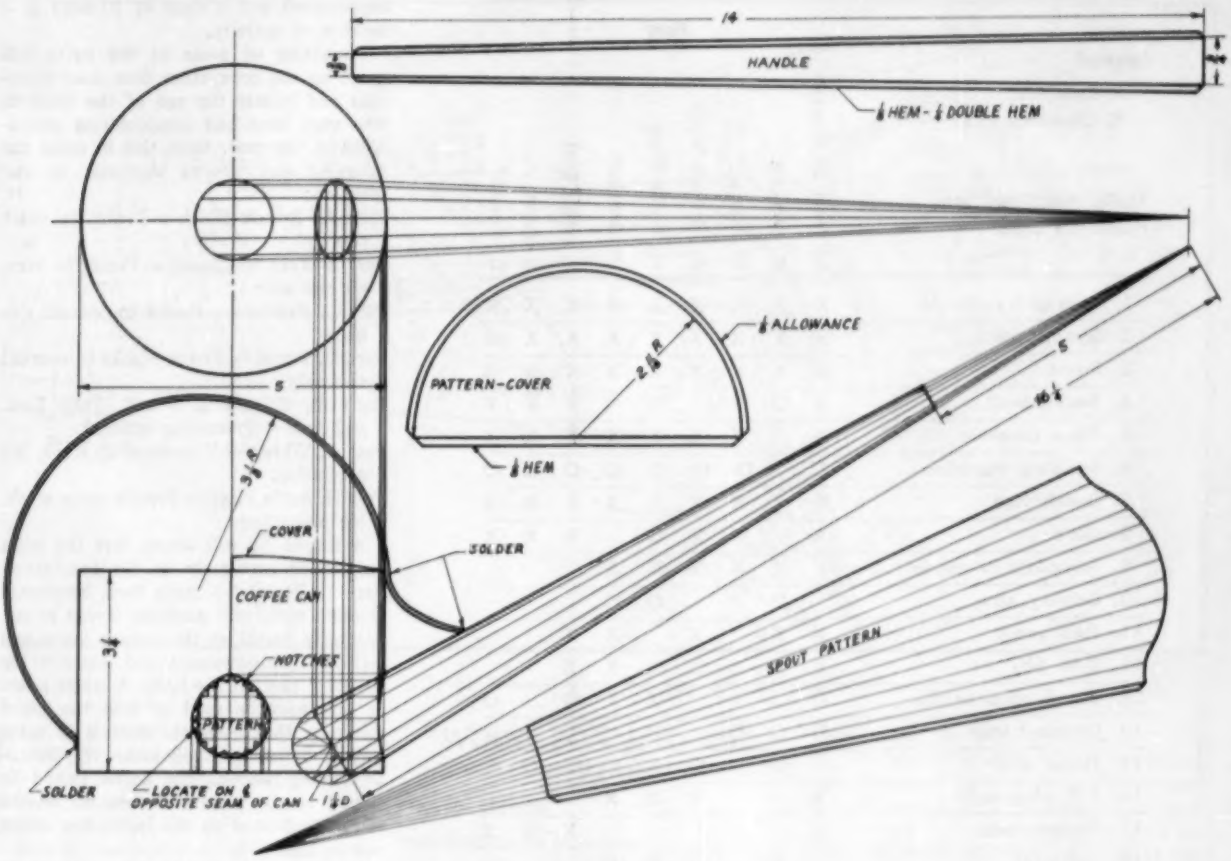
Once petroleum is found, it may take all an oil man's skill, ingenuity — and money — to coax it to the surface. Some crude oils, such as those having a high wax content are so sluggish that they "butter up" at temperatures of 90 degrees Fahrenheit or less. One solution to this problem is to construct costly heating plants near the producing wells. By heating the hydraulic oil that circulates to the pumps down the well, enough heat is introduced down the well to keep the crude oil liquid and flowing. Such techniques indicate the huge financial outlays necessary to keep the nation supplied with gasolines, fuels, lubricants, and other petroleum products. — *Petroleum Newsnotes.*

A WATERING CAN

ARTHUR C. WENZEL
Principal, Pennsylvania School for the Deaf
Philadelphia, Pa.

The watering can is a popular project since it can be made in a relatively short time and lends itself to creative expression in decorative effects. The cost of this *take-home* project is kept to a minimum by

The completed watering can



Details of the watering can

using No. 10 cans for the parts along with the discarded coffee can for the container. Then, too, it is a practical item to have in the home or office for watering potted plants, cut flowers, etc.

Bill of Material

One coffee can; one spout; 30-ga. by 4½ by 11½-in. tin plate; one cover 30 ga. by 3½ by 6-in. tin plate; one handle 30 ga. by 1⅜ by 14½-in. tin plate; painting supplies; and solder.

Tools and Equipment

Tin snips, aviation snips, scriber, combination square, mallet, flatnose pliers, soldering copper, stakes, bar folder, slip roll, and wiring machine.

Procedure

1. Cut pieces of tin plate for the cover, spout, and handle.
2. Make layouts from drawing, or use template.
3. Cut each part on scribed line.
4. Break grain and form each part.

4a. A single hem, double hem, or wired edge may be used for the handle.

5. Place layout for spout opening on center line opposite seam of coffee can and allow for notching.
6. Cut opening as well as notches and form to angle of spout.
7. Sweat solder spout to can.
8. Solder cover to can as shown.
9. Solder handle to can as shown.
10. Paint and decorate as desired.

Submitted by Louis J. Enos, Lincoln Junior High School, Sacramento, Calif.

TOY ATOMIC CANNON

FLOYD R. HUFFMAN
Instructor of Industrial Arts
Redwood Falls, Minn.

Projects which give the beginning industrial-arts woodworking student a maximum of shop experiences with a minimum expenditure of time and money are always in demand. The toy atomic cannon described herewith is in keeping with this *Atomic Age* and has proved to be an excellent project for beginning woodworkers. Experiences gained by the beginning woodworking student in industrial arts in the making of this project are indicated on the experience chart, Figure 1.

The toy atomic cannon has been made

Toy atomic cannon

Legend:
X Essential
O Optional

Tools, machines, and materials used:	Part B. Trail or Chassis	G. Wheels	D. Barrel	A. Breach Block	H. Baffle Plate	C. Brackets	F. Trail Rest	I. Axle	E. Recoil
1. Rule or try square	X	X	X	X	X	X	X	X	X
2. Sandpaper	X	X	X	X	X	X	X	X	X
3. Paint	X	X	X	X	X	X	X	X	X
4. Backsaw	X	O	X		O		X	X	X
5. Claw hammer	X		X	X	X	X	X	X	X
6. Sanding machine	O		O	O	O	O	O	O	O
7. Bench vise	X		X	X	X	X	X	X	X
8. Glue	X		X	X	O		X	X	X
9. Template or model	X	X	X	X	X	X			
10. Coping saw		O			O	O			
11. Drill press	X	X		X		X	X		
12. Drill bits	X	X		X		X	X		
13. Wood rasp or file	O				X	X	O		O
14. Crosscut saw	O	O	O		O				
15. Hand drill		O		O		O		O	
16. F.H. wire nails	X			X	X	X			
17. Dowel rods							X	X	X
18. Jig saw		X			X	O			
19. Marking gauge	O			O					
20. Jack plane	X		X						
21. Block plane	O		O		O				
22. Pine	X		X	X					
23. Turning lathe		X	X						
24. Gouge		X	X						
25. Skew		X	X						
26. Parting tool			X						
27. Calipers		X	X						
28. Brad awl	X	O		X					
29. Masonite					X	X			
30. Ripsaw	O								
31. Countersink bit		X							
32. Compass		X							
33. Brace and auger bit				X					
34. Jig						X			
35. Wire brads	X							X	
36. Wood screws		X							
37. Plywood		X							

Fig. 1. Experience Chart — Floyd R. Huffman

by our beginning seventh grade woodworking students from the instruction sheet illustrated in Figure 3 with a great deal of satisfaction. Our woodworking shop is equipped with two turning lathes, one drill press, one jig saw, one disk and drum sanding machine and the normal complement of hand tools. No bottle necks were encountered and a class of 20 boys is a beehive of activity.

Precutting of some of the parts will speed up the completion date, save materials and bolster the ego of the students who may have had disappointing experiences in the past. With this in mind the following has proved desirable in our situation:

Part A. Breach Block — Precut to exact size

Part B. Trail or Chassis — Precut to over-all size only

Part C. Brackets — Precut to over-all size only

Part D. Barrel — Precut blanks to over-all size only

Parts E, F, and I. Recoil, Trail Rest, and Axle — Precutting optional

Part G. Wheels — Provide scrap stock. No precutting.

Part H. Baffle Plate — Provide scrap stock. No precutting

A simple jig will insure that the holes are drilled accurately in the brackets — Part *C*. Templates made from hardboard or sheet metal will minimize layout errors. A sample barrel, at the turning lathe, will facilitate measurements and simplify the students' task on the lathe. A single screw or bolt may be used to hold the wheel stock on the faceplate while it is being turned. Some boys will make very realistic looking wheels. The barrel should be turned in one piece and then cut to the lengths indicated on the instruction sheet, and in Figure 2.

Extreme care should be exercised in laying out for and inserting the nails in the breech block (part *A*) and the trail piece (part *B*) if the assembly is to move freely to its forward and rear positions and rest flat in each position. It will be noted that the $\frac{5}{64}$-in. holes drilled in the brackets (part *C*) will allow for minor errors in assembly. For instructors who prefer the use of templates, the nail holes may well be marked by this means. For others, it is a chance for their students to exercise precision workmanship.

When the project is undertaken prior to Christmas, the finished product may be used as a sturdy gift to a younger member of the family or one can be sure that the maker will enjoy his finished project and be richer for the experiences gained in the woodworking area.

Pre-cut stock will avoid waste. Templates of A, B, C, D, and H will insure proper layout. Care should be exercised in marking and drilling all holes.

Pieces need not be made in any particular order.

D — turn and sand pieces as demonstrated. Cut the two pieces to the required length. Drill a test hole (a $\frac{3}{4}$-in. auger bit is marked with a 12 or $12\frac{3}{16}$ in.) in a scrap piece before making holes in A.

E — Trace from template and make pieces proper size and shape. Cut front

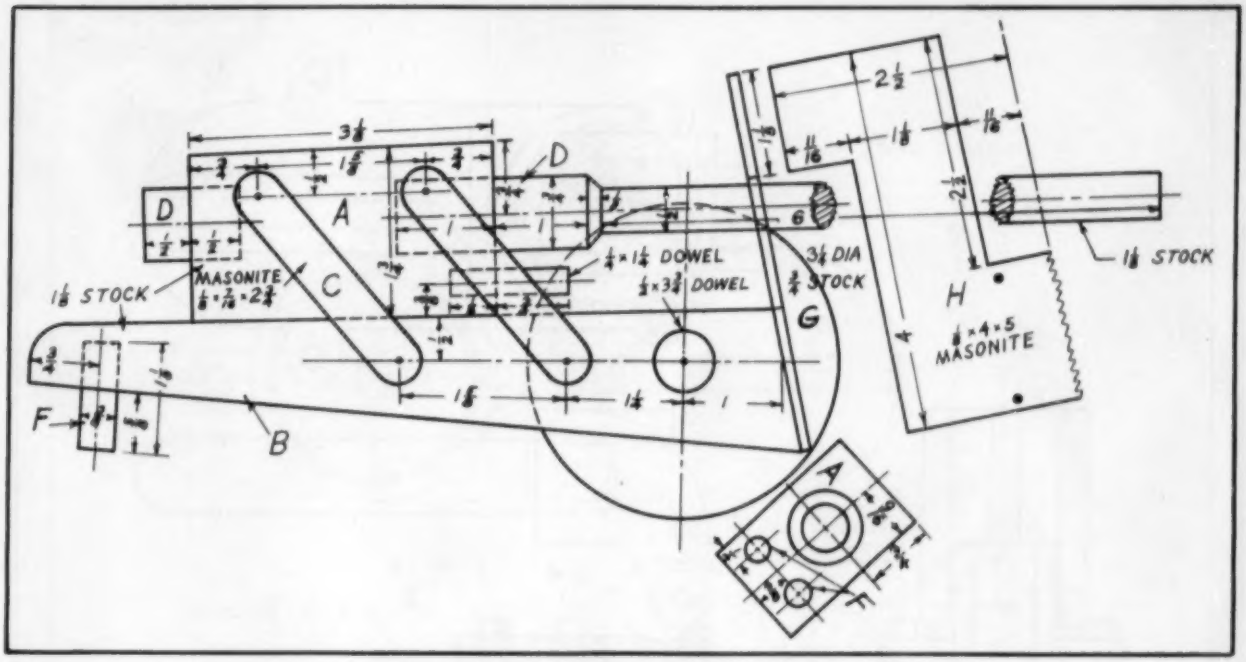


Fig. 2. Detail drawing of the toy atomic cannon

angle with a miter box saw. Mark centers and drill holes, check the sizes.

C — Use the jig provided and drill 5/64-in. holes. Shape ends.

G — Cut out on the jig saw. Drill 5/16-in. hole in the center on the drill press. Turn to size and shape as demonstrated. Sand on the lathe. Countersink hole for the head of 1½ in. by 10 flathead bright wood screw.

H — Trace from the template and cut to shape with the jig saw.

I — Drill ⅛-in. anchor holes.

A mark of a good workman is that he sands his pieces smooth *after* he has completed his work with the cutting tools.

Extreme care should be exercised in the laying out for assembly of pieces A, B, and C. Use ⅝-in. by 18 flathead wire nails and do not drive them in so far that the pieces do not work freely, as the paint will tend to tighten the action. Pieces should fit in both the forward and the rear position.

Fasten H on B with five 1-in. by 18 flathead wire nails as indicated on the drawing.

The smoother the pieces are sanded the smoother the paint job will be.

When paint is applied it is well to place a nail in between pieces A and B to prevent the pieces from sticking together.

Fig. 3. Instruction Sheet

Peacetime military jet fuel requirements for the current year have been estimated at the staggering total of 10 million gallons daily. — *Petroleum Newsnotes.*

WOOD BOX FOR THE FIREPLACE

DAVID ENSLEE
Industrial Arts Instructor
Morris Hills Regional High School
Rockaway, N. J.

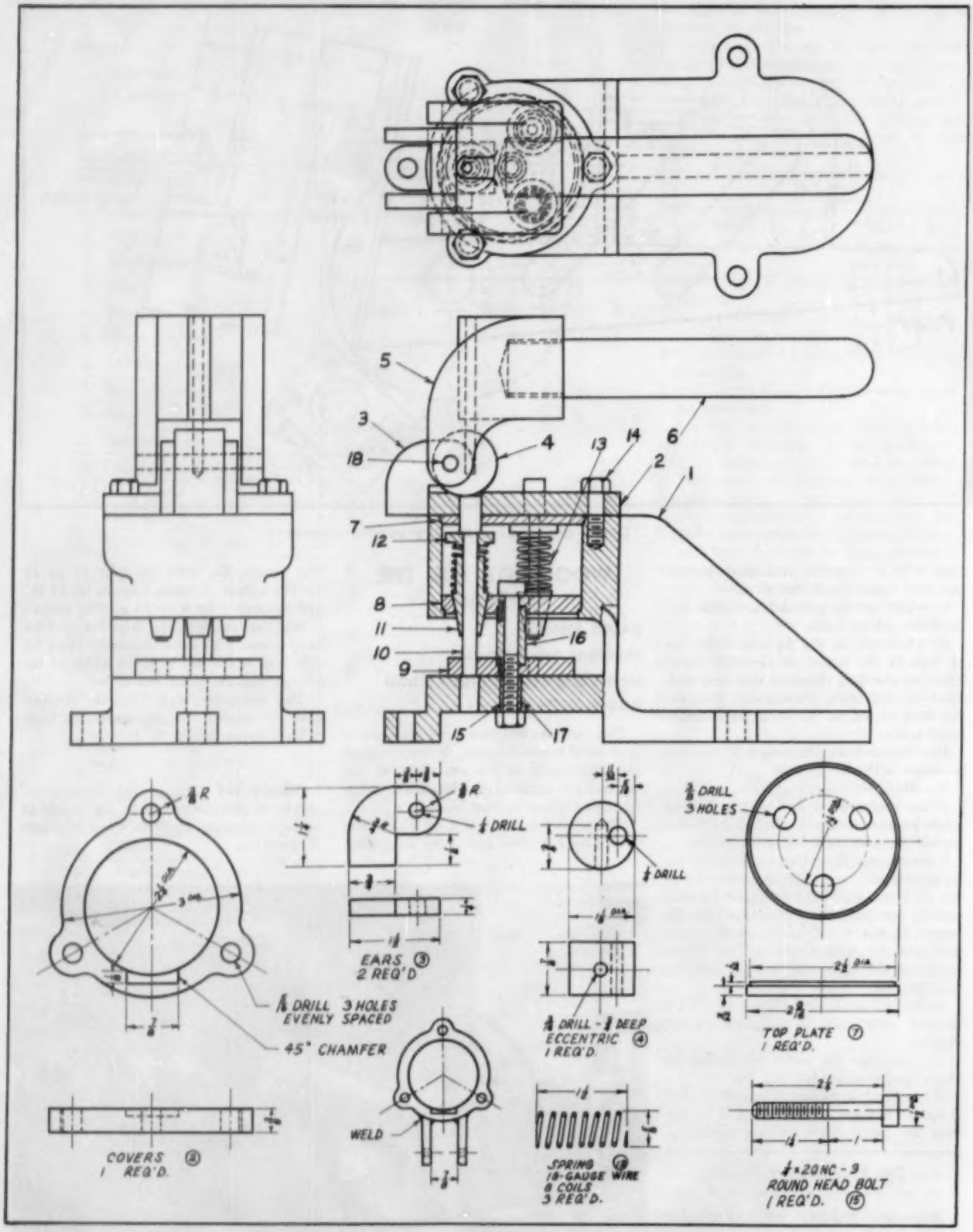
This article describes and pictures a large wood box and carrier. It was designed and constructed by my son while he was in the sixth grade of the Mountain Lakes Grammar School in New Jersey.

The project is made of 1 by 12-in. pine with 2 by 2-in. feet and ¼ by 1-in. black iron handle. The sides are 1 by 12 by 24 in. The bottom is made 1 by 16 by 24 in., and supports 1 by 4 by 20 in. The project is held together with No. 8 by 1¼-in. blue head screws with the exception of the 2 by 2-in. legs which run with the width of the bottom and are glued and nailed.

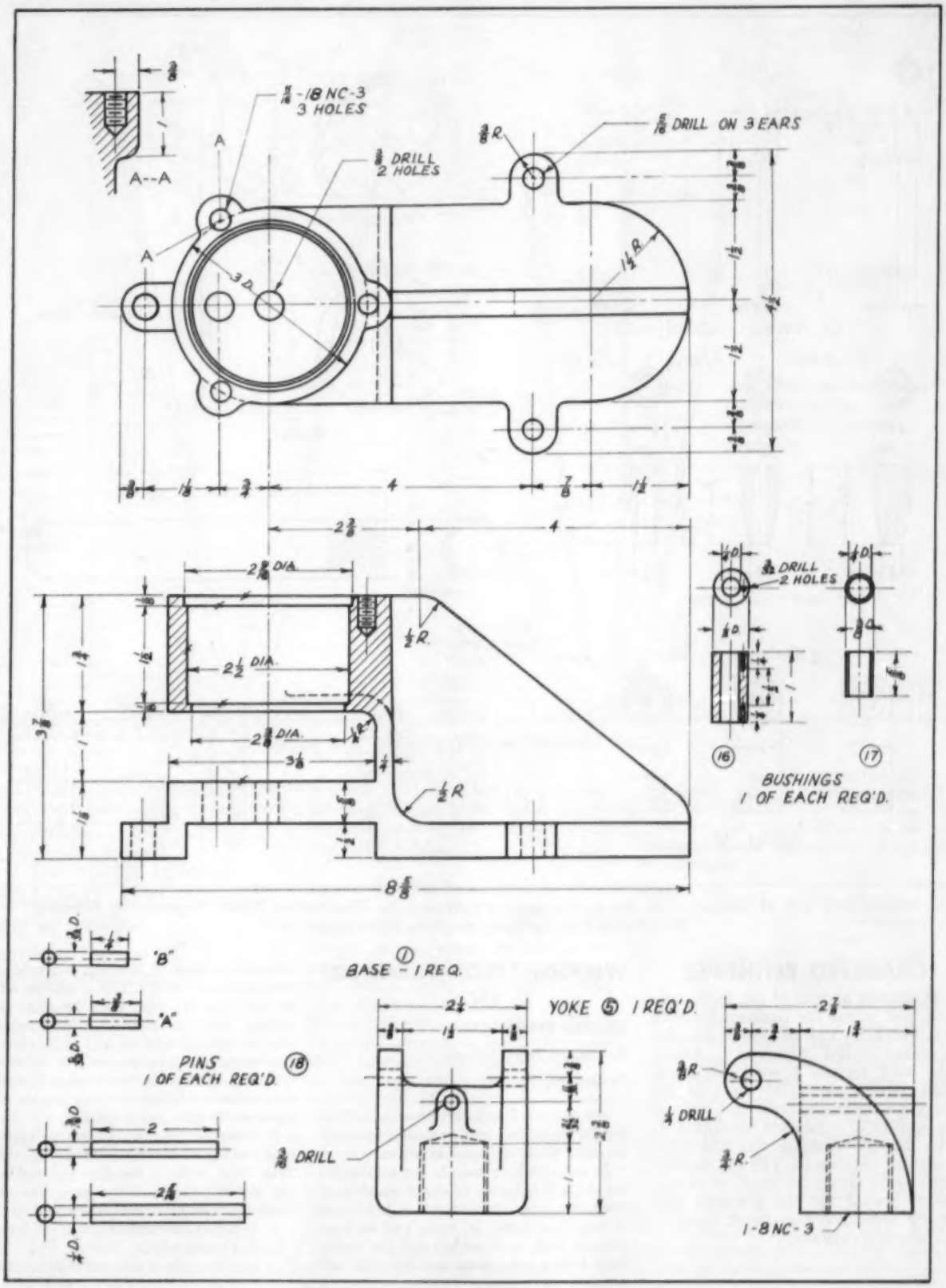
The instructor was Kenneth Webber, now a teacher at Bernardsville High School, Bernardsville, N. J.

Ninety per cent of the world's reserves of petroleum are in the hands of non-Communist nations. — *Petroleum Newsnotes.*

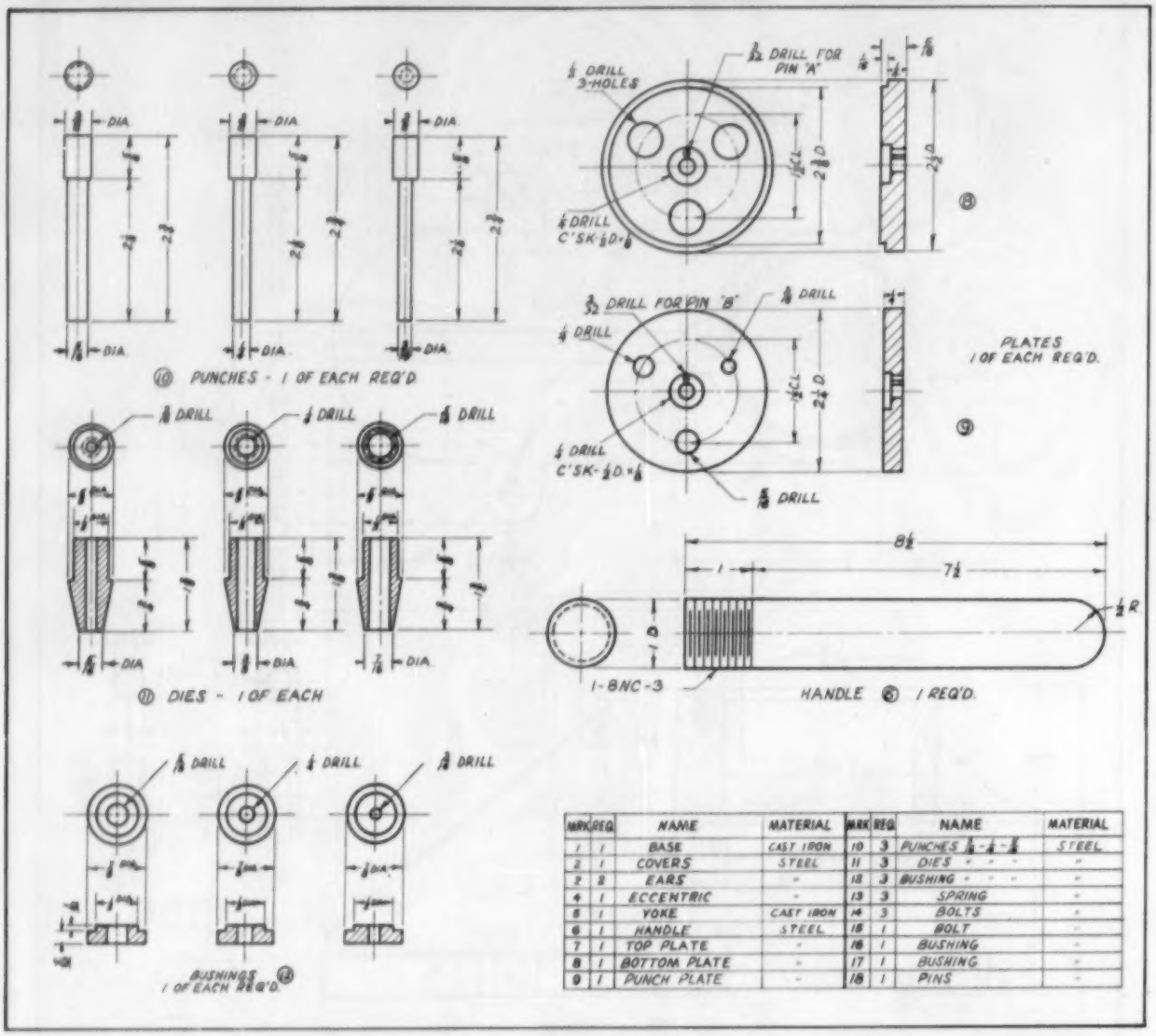
Wood box made by author's son, George Enslee, year 1953–54



The punch press by Walter H. Harrington, Head, Engineering Drafting, New Hampshire Technical Institute, Manchester, N. H.



Further details of the punch press



MRK	REQ	NAME	MATERIAL	MRK	REQ	NAME	MATERIAL
1	1	BASE	CAST IRON	10	3	PUNCHES ⅛-¼-⅜	STEEL
2	1	COVERS	STEEL	11	3	DIES " " "	"
2	2	EARS	"	12	3	BUSHING " " "	"
4	1	ECCENTRIC	"	13	3	SPRING	"
5	1	YOKE	CAST IRON	14	3	BOLTS	"
6	1	HANDLE	STEEL	15	1	BOLT	"
7	1	TOP PLATE	"	16	1	BUSHING	"
8	1	BOTTOM PLATE	"	17	1	BUSHING	"
9	1	PUNCH PLATE	"	18	1	PINS	"

Details and bill of materials of the punch press by Walter H. Harrington, Head, Engineering Drafting, New Hampshire Technical Institute, Manchester, N. H.

GRAIN-FED REFINERIES

Thousands of tons of oat hulls, corn cobs, and wheat are compounded with chemicals every year to form an amazing substance called "furfural." Among other uses, furfural is employed in the giant solvent extraction units of the nation's refineries to treat and improve the quality of petroleum lubricants. It does this by removing tars and other unwanted substances. The oil industry looks to the farmer for many of the materials needed for the processes that supply America's growing oil needs. — *Petroleum Newsnotes.*

Mississippi produces 100,000 barrels of oil every day from 106 fields located in 29 counties. — *Petroleum Newsnotes.*

WROUGHT IRON FURNITURE LEGS

LELAND STROMBOM

Sycamore High School

Sycamore, Ill.

The wrought iron type of leg has arrived and its impact has been expressed on many different pieces of wood furniture.

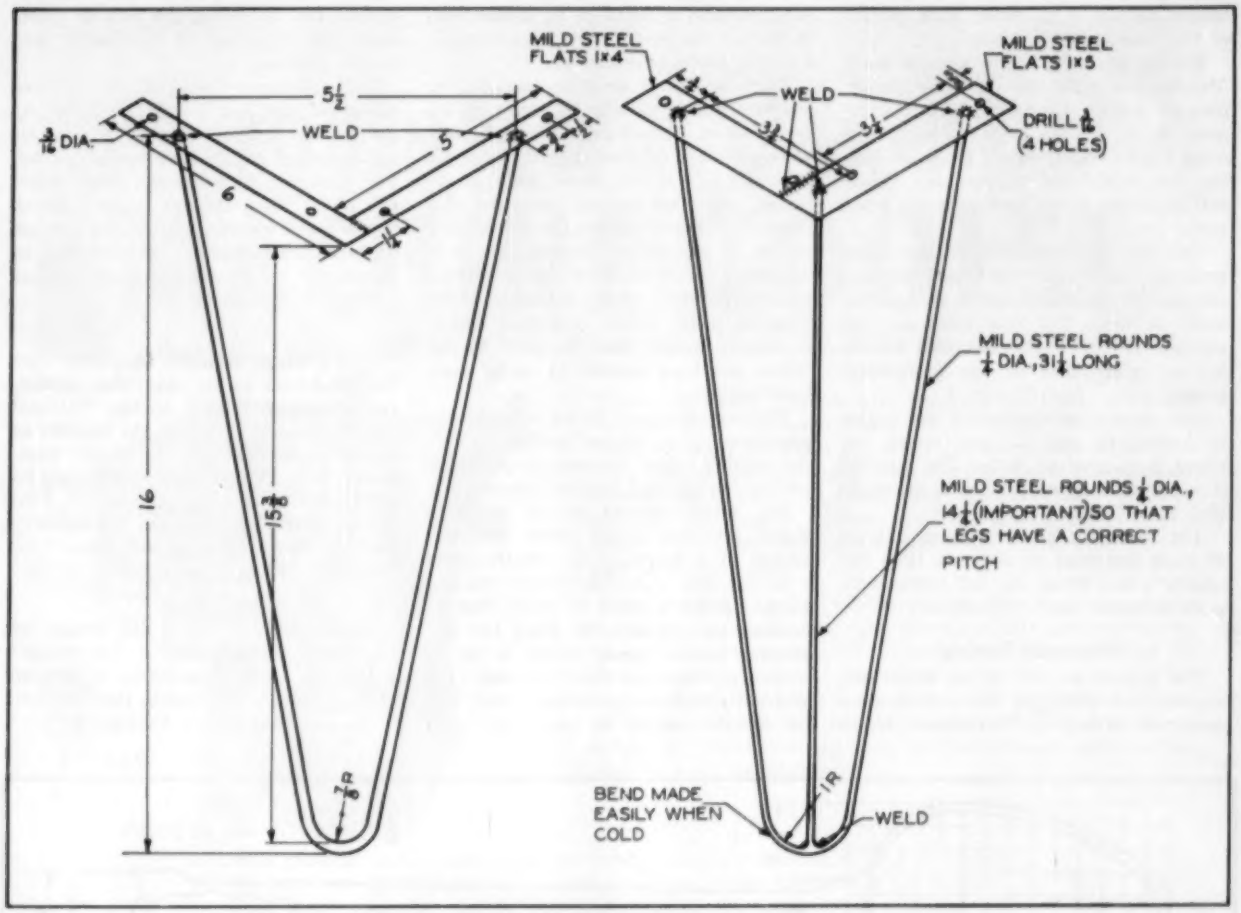
In order to keep pace in our woodworking shops it behooves us not to stand aloof from this type of construction, but to go to meet it squarely. In our school we have gone to work on these legs and the results have been a good many satisfied boys and parents.

1. *Cost:* We can make these furniture legs in our school for $1.85.

2. *Equipment:* One gas welding outfit is sufficient for heating, bending, and welding. Perhaps if you do not have a welding outfit you can do your own bending and cutting, then take them to a local welder who can quickly weld the legs to the plates. The average shop equipment will suffice to take care of the other operations. Another alternative would be for your metals department to give you assistance.

3. *Planning:* Give your boys an opportunity to lay out the plans for one leg, then have them make a bending and welding jig. We did this and the boys met the challenge with great enthusiasm.

4. *Order of operations:*
   1. Consult plan.
   2. Cut stock to size and drill holes.
   3. Place in jig and bend partially.
   4. Heat to cherry red.
   5. Complete bend.
   6. Place plates and leg in jig.


MILD STEEL FLATS 1×4
MILD STEEL FLATS 1×5
WELD
WELD
DRILL (4 HOLES)
MILD STEEL ROUNDS DIA., LONG
MILD STEEL ROUNDS DIA., (IMPORTANT) SO THAT LEGS HAVE A CORRECT PITCH
BEND MADE EASILY WHEN COLD
WELD

Details of the wrought iron furniture legs

7. Weld or braze (preferably braze).
8. Apply two coats of *flat* black enamel.

SIMPLIFIED LUMBER GRADING AND TESTING

ERNST H. SUERKEN
Supervising Principal
Union Free School District,
Greenburgh No. 11
Dobbs Ferry, N. Y.

Lumber grading, a confusing number system used for determining the condition of lumber to be purchased, is being simplified. This simplification will remove the guesswork in selecting lumber for purchase while providing a great saving for all those who use lumber.

The start was made March 15, 1956, by the companies within the West Coast Lumberman's Association who agreed to grade their lumber with names instead of numbers. This will enable everyone to understand what they are buying and how much money should be spent. This new system of lumber grading which affects over half the nation's output, is the most significant change in the lumber industry since the first grading rule was written way back in 1754.

How the System Works

The new system with its simplified data and terminology is designed particularly for the popular grades of lumber. The new grading works in this manner: Number One common lumber becomes *Construction;* Number Two becomes *Standard;* Number Three becomes *Utility;* and Number Four becomes *Economy.* Each of these grades has specific values and uses throughout the construction industry and for everyday projects in both the school shop and the home workshop.

The names for numbers system may start a trend in other lumber producing regions throughout the country. Immediately, it will affect such people as lumber dealers, carpenters, home craftsmen, engineers, and architects. Actually the first person to feel the change-over will be the graders in the sawmills of the Pacific coast. The new system includes Douglas fir, West Coast hemlock, Western red cedar, and Sitka spruce grown in western Oregon, Washington, northern California, and British Columbia.

Basically all lumber is graded for its suitability to the use intended. There are two divisions:

For appearance:	*For strength:*
Clears	Construction
Upper	Joists
Pattern grades	Timber dimensions

There are many special grades for literally thousands of special purposes. Fir and hemlock, for example, have stress grades and engineering values carefully established throughout the years by research and tests conducted by the industry.

The West Coast Lumberman's Association has prepared a booklet on the grading system which has been issued to retail yards handling lumber used for home building and light construction work. The booklet points out to the consumer that the thickness of boards and finish items has been reduced from twenty-five-thirty seconds to three-quarters of an inch because most of these items have been sold in the three-quarter-inch thickness for years. Under the new grading, 6-inch

boards become 5 ½ inches wide instead of the previous 5 ⅝ inches.

The top grade for boards remains *Select Merchantable* while the top grade for dimension lumber also remains *Select Structural*. Rural families have for years been using *Utility and Economy* grades of lumber for repair and maintenance. These will be better suited than ever for stress work.

This new grading system has simplified much of the old-fashioned, detailed, and complicated grading system used previously. It means that lumbermen are considerate of the buyer and user of the lumber rather than of the professional grader.

Still another development is the testing of lumber to find out how strong and sound is a piece of wood. The question is important because lumber is so widely used in building.

The internal characteristics of a piece of wood determine its strength. High frequency sound waves can tell much about grain structure and irregularities.

Ultrasonic Testing

The possibilities of testing wood with concentrated ultrasonic waves were demonstrated recently in Washington, D. C. What happens to sound on its journey was shown on the screen of an oscilliscope, a device like a television set.

Traditionally, as we have said, lumber has been graded visually by highly skilled specialists who follow rules. The specialists know trees and lumber and such strength indicators as size and shape, grain irregularities, and other physical properties of a piece of lumber of a given species. Grading by eye is remarkably accurate, but it is impossible to measure strength without actually loading a piece of lumber to the breaking point. Hence structural lumber is usually larger than it need to be. Safety has been assured by using oversized lumber.

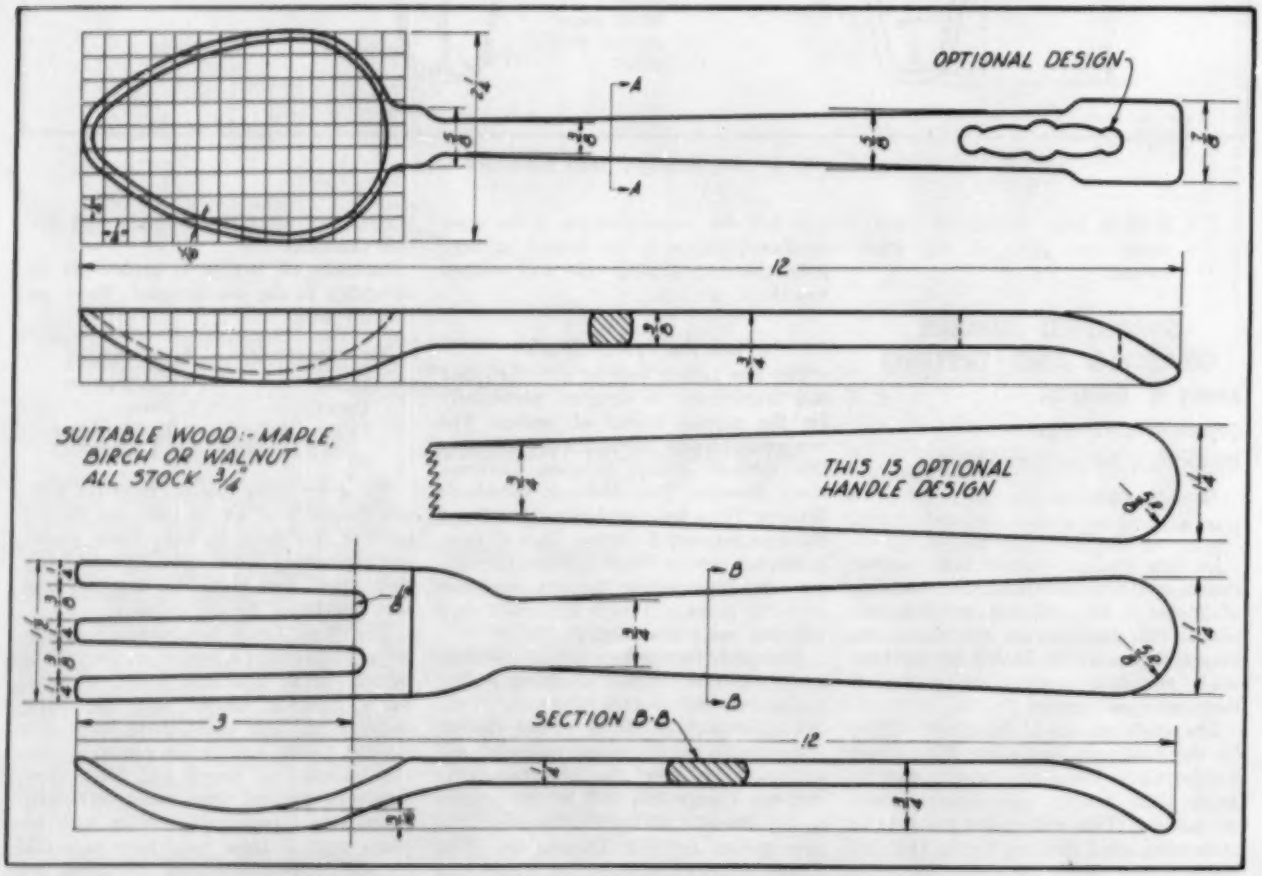
The new ultrasonic device will take the guesswork out of lumber grading, so that the smaller, more economical pieces of lumber can be used for load bearing.

The tester consists of an electronic sound generator which sends pulsating current at a frequency of 500,000 cycles a second into a quartz crystal which is placed against a piece of wood. The vibrations pass through the wood and into another quartz crystal which is set in motion by the vibration of the wood. The received vibrations are changed back into an electric current in much the same manner that a phonograph pick-up transforms the vibration of the needle into electric current.

The differences between the uniform vibrations fed and those picked up by the receiver indicate a good deal about the structure of the intermediate wood. For example, it is known that sound will travel faster through dense material. If the sound speeds up in passing through the wood, the operator concludes that an irregularity has been encountered, such as a dense internal knot.

The average accident frequency rate for employees in all industries submitting company reports to the National Safety Council, based on the number of disabling injuries per 1,000,000 man-hours, was 6.96 in 1955 — a reduction of 4 per cent from the year before. This is the first time that the all-industry rate has been held to less than 7. — *National Safety Council.*

Want to keep the finish bright on aluminum fixtures inside the house? Clean first and then apply a thinned coat of pure, white shellac that is fresh. — *Shellac Information Bureau.*



Wood salad set by Louis Barocci, High School, Cudahy, Wis.

YOU NEED RUGGED MACHINE TOOLS!

NEW CLAUSING 10" SAW

There are many reasons why Atlas-CLAUSING metal and woodworking machines meet school needs best. They're ruggedly built to stand up under inexpert student use year after year! Their fine quality construction assures you accurate, trouble-free service. Each has many exclusive easy-operating features that enable students to learn machining principles faster . . . and with less supervision. *And they set the standard for safety!*

Their moderate prices enable you to buy more equipment per dollar invested . . . to give more students the opportunity to get adequate operational experience. When you plan for shop expansion or tool replacement get the facts on these rugged Atlas-CLAUSING machines. We'll gladly send you complete catalogs and specification sheets which you can use as guides in determining your recommendations and requisitions — write for them now!

Way ahead in quality, performance and value, the all-new Clausing 10" Saw is heavier throughout . . . more powerful . . . and unmatched for ease of operation and performance. Saw alone weighs 385 lbs! ¾" diameter arbor . . . sealed-for-life, preloaded ball bearings . . . exclusive, new, totally enclosed, fan-cooled, continuous-duty motors, up to 3 HP. 3 big table sizes, up to 54¾" x 27½". Double-locking, lift-off fence.

24" JIG SAW

Unmatched for smoothness — the secret is the precision balance of its exclusive drive mechanism. The weight of each part is accurately balanced to the weight of every other part. Variable or 4-speed models. Heavy, pyramid design safety stand.

BELT & DISC SANDER

Sands any width boards, angles, curves, metals, plastics. 10" disc, 4" belt — operates in both horizontal and vertical positions — table tilts 45° Sealed-for-life ball bearings — rugged construction throughout. Heavy safety stand.

6" JOINTER-PLANER

42" precision ground table — 32 x 4½" fence supported close to cutter head, tilts 45° both ways. One piece, precision ground cutterhead-spindle turns on sealed-for-life ball bearings. Heavy safety stand!

15" DRILL PRESS

Extra heavy head, table, column, base. Exclusive 4-ball bearing "floating drive" insures long, accurate service. Quick-positioning, direct-reading depth control stop. Bench and Floor Models.

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CLAUSING DIVISION Atlas Press Company

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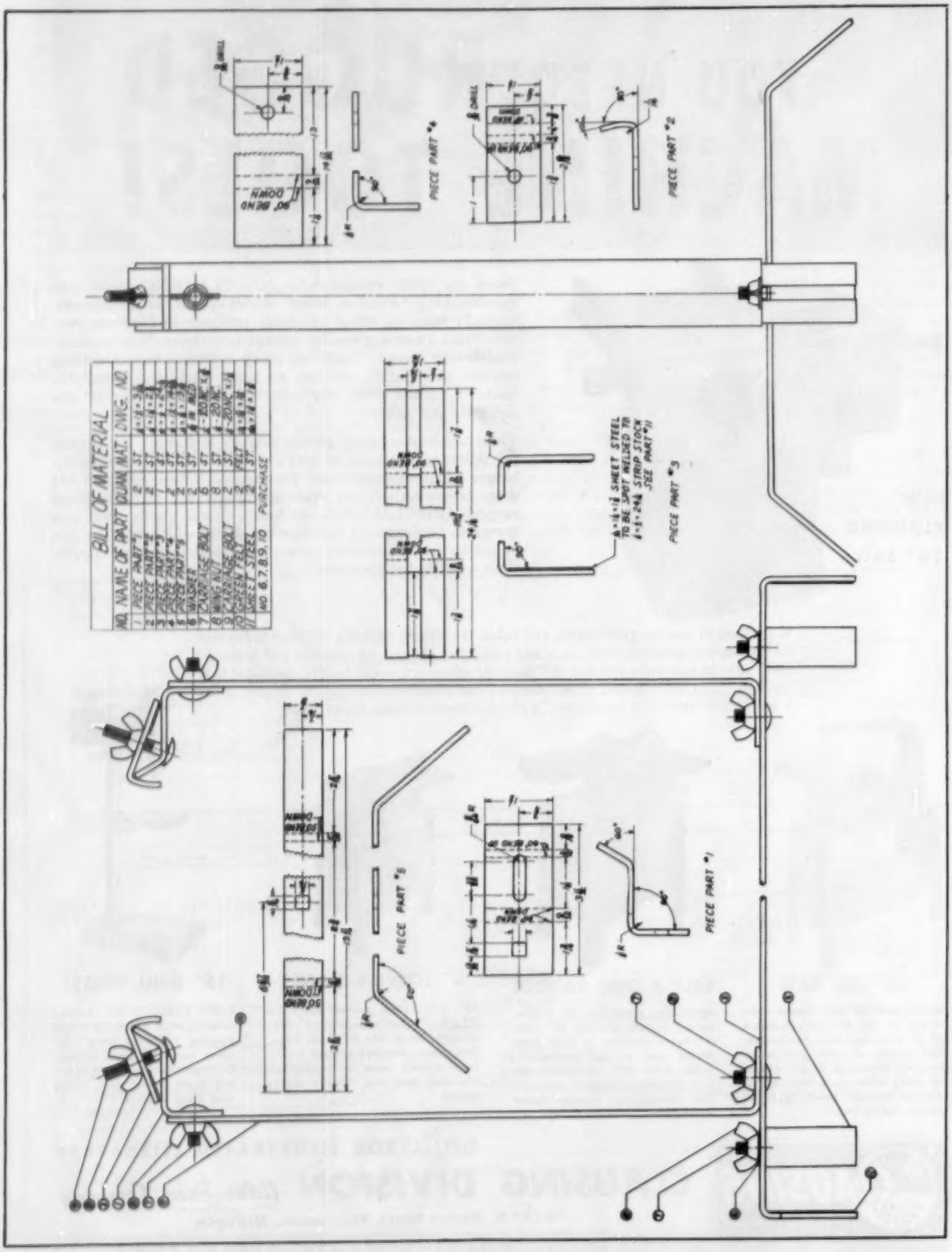
Quality Machine Tools Since 1911

BAND AND JIG SAWS — WOOD LATHES — SPINDLE SHAPERS — SANDERS — METAL SHAPERS — GRINDER-HONE

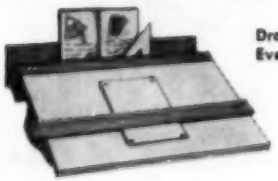

BILL OF MATERIAL
NO. NAME OF PART QUAN. MAT. DWG. NO
1 PIECE PART #1 2 ST
2 PIECE PART #2 2 ST
3 PIECE PART #3 1 ST
4 PIECE PART #4 2 ST
5 PIECE PART #5 2 ST
6 WASHER 2 ST
7 CARRIAGE BOLT 6 ST
8 WING NUT 6 ST
9 CARRIAGE BOLT 2 ST
10 SCREEN 2 BRASS
11 WIRE SCREEN STEEL
NO 6,7,8,9,10 PURCHASE
PIECE PART #4
PIECE PART #2
PIECE PART #3
PIECE PART #5
PIECE PART #1

Phonograph turntable-stand assembly by Walter H. Harrington, Head of Engineering Drafting, New Hampshire Technical Institute, Manchester, N. H.

NOW! A TOTAL EXPERIENCE PROGRAM FOR YOUR SHOP—FROM *Sheldon*

Q-1000 Industrial Arts Work Center for six students, with individual storage for three classes.

Featuring THE NEW 6-STUDENT WORK CENTER



Drawing Board for Every Student

New Combination Woodworking-Metalworking Vise for Every Student

Now your industrial arts shop can have the many advantages of a Sheldon Total Experience Program. It provides every student equal opportunity for learning experiences in all phases of industrial arts. This is a compact, comprehensive program that makes teaching far easier and more rewarding for you.

The new Sheldon 6-student work centers serve as the nucleus of the Total Experience Industrial Arts Program. At each of these centers you can teach woodworking, metalworking, mechanics, drawing, electricity. They are also designed and equipped for study, class discussion, demonstrations. Around these Sheldon integrates in an educationally correct floor plan all the teaching facilities you need. Special activity benches. Power tools. Project areas. Everything for maximum learning and teaching efficiency – in minimum space.

This important new program and equipment are described in the new Sheldon Total Experience Industrial Arts Catalog. It's free. Reserve your copy today.

See it at A.V.A. Convention. Complete new Industrial Arts catalogs will be available from Sheldon at the A.V.A. meeting Dec. 3-7 in Kiel Auditorium, St. Louis, Mo. Booths 64-66.

E. H. *Sheldon*
EQUIPMENT CO.
MUSKEGON, MICH.

PERSONAL NEWS

(Continued from page 6A)

of trade and industrial education for Nevada. In the meantime he resumed the trail of higher education and returned to Colorado A. & M. College the following summer, and returned each summer since that time. Thus was the man who never actually attended high school awarded a master's degree in administration and supervision.

H. HALLECK SINGER IN NEW POSITION

The appointment of H. Halleck Singer as an assistant professor in the Vocational Teacher Education Department of the University of Pennsylvania School of Education was recently announced by Dr. Walter B. Jones, director of the department. Mr. Singer will fill the vacancy created when Dr. Edward Hankin left to become head of the Trade and Industrial Education Department at Florida State University, Tallahassee, Fla.

H. Halleck Singer

Mr. Singer came to the Philadelphia area two years ago as an Area Co-ordinator of Industrial Education representing the Pennsylvania Department of Public Instruction in six eastern counties. He has had 26 years of experience as a teacher and director of vocational and industrial arts education in the public schools. He has had general administrative experience as an assistant high school principal and was principal of the Arnold High School, Arnold, Pa., for five years.

Mr. Singer received his bachelor of science degree from Carnegie Institute of Technology and his master of science degree from the University of Pittsburgh. He is currently working for his doctorate at the University of Pennsylvania.

His chief work experience has been in the field of electricity and electronics.

CHESTER B. AINSWORTH JOINS STAFF AT EAST TEXAS STATE TEACHERS COLLEGE

Dr. Chester B. Ainsworth joined the staff of the Industrial Education Department, East Texas State Teachers College, Commerce, Tex., September 1, 1956. Dr. Ainsworth earned his B.S. degree in mechanical engineering at John Brown University, Siloam Springs, Ark.; the M.S. degree in industrial education at Oklahome A. & M.; and the doctor of education degree in industrial education at the University of Missouri. He also did graduate work at Bradley University during the summer months of 1951, 1952, and 1953.

Chester B. Ainsworth

Dr. Ainsworth has had wide and extensive teaching experiences. He taught industrial arts at the IOOF home in Corsicana, Tex.; at the Bristow High School and Junior College in Bristow, Okla.; and was associate professor of industrial education at the Arkansas State Teachers College, Conway, Ark., for seven years. Dr. Ainsworth did part-time teaching in the machine shop of the mechanical engineering department at the University of Missouri while completing his study for the doctor of education degree at Missouri. He also taught aircraft mechanics at Chanute Field, Ill., and at Sheppard Air Force Base, Wichita Falls, Tex., during World War II.

At East Texas State, Dr. Ainsworth will teach advanced metalwork and graduate courses in industrial education.

While in Arkansas he served on various state industrial arts committees and was very active in the development of industrial arts in the state in general. Dr. Ainsworth is a

(Continued on page 26A)

C&P NEW SERIES PRESSES These presses in sizes of 8x12, 10x15, 12x18 and 14½x22, provide the student with equipment that furnishes all practical requirements of hand fed press operation. May be equipped with flywheel, belt and platen guards. Also furnished for treadle operation instead of motor drive.

CHANDLER & PRICE
PRESSES and PAPER CUTTERS

C&P BENCH CUTTER An efficient, small size cutter that handles sheets up to 19"x24". Equipped with two-handed safety control.

C&P PILOT PRESS A thoroughly efficient little press, chase 6¼x10, that teaches basic principles of press operation with exceptionally fine printing results.

The Standard for Printing Education

C & P presses and paper cutters have been standard equipment in commercial plants and schools for over 50 years. So, the selection of C & P equipment for printing classes places before the students *practical* equipment exactly as used in commercial practice in the entire printing industry.

In addition, special safety features are incorporated, when desired, in C & P presses and paper cutters so that all safety requirements are fully satisfied.

For practical instruction—for safety in use—the foresighted administrator recommends . . . Chandler & Price.

"HANDBOOK OF PLATEN PRESSWORK" is one of the outstanding aids to printing furnished without charge to printing instructors. If you do not have a copy, just request one.

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6000 CARNEGIE AVENUE • CLEVELAND 3, OHIO

Estwing

Unbreakable Hammers

last a lifetime!

HIGH ALLOY STEEL TUBE FUSED TO HEAD

FORGED IN ONE PIECE

NEOPRENE-PLYOLITE CUSHION GRIP

LEATHER CUSHION GRIP

SAFE • DEPENDABLE • GUARANTEED

Eliminates danger and replacement of loose, broken, or splintered handles.

Both tubular and one-piece hammers are made by Estwing, the inventors and the only specialists in UNBREAKABLE hammers for over 30 years.

Estwing assures you of greatest value and satisfaction.

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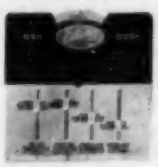


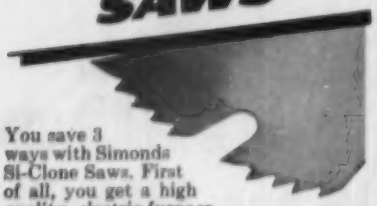
NEW NAIL GUIDE

Handy calculator tells right nail to use . . . proper use of hammer . . . number of nails per pound.

SEND 10c FOR NAIL GUIDE AND CATALOG . . . WRITE DEPT. IA-10

ESTWING MFG. CO., ROCKFORD, ILL.

Cut Your Saw Blade Bill with SIMONDS SI-CLONE SAWS



You save 3 ways with Simonds Si-Clone Saws. First of all, you get a high quality, electric furnace alloy steel saw at popular price. Second, you get longer service between sharpenings because Simonds steel holds a keen edge longer. And finally, you get smoother, straighter cuts that need less finishing, save time, mean better work.

What's more, you have a choice of 13 types of saws up to 12" diameter for specific cutting needs, for use on all standard table, radial arm or portable electric hand saw machines.

Get these money-saving saw blades from your hardware or mill supply dealer . . . send for Catalog "B".

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

Factory branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que.

PERSONAL NEWS

(Continued from page 24A)

member of Phi Delta Kappa, American Industrial Arts Association, and the American Vocational Association.

LOUIS A. SCHWARK RECEIVES APPOINTMENT

The Board of Education of the Modesto City Schools, Modesto, Calif., has announced the appointment of Louis A. Schwark to the position of director of trade and industrial education. He succeeds J. K. Barnett, who has retired.

Mr. Schwark has been a teacher for some years at the Junior High School, High School, and Adult Education levels. He has recently been chairman of the Trade and Industrial Education Department at the Thomas Downey High School. He is an active participant in the affairs of the California Industrial Education Association.

His qualifications include training in industrial arts. He also qualifies as a journeyman carpenter. Thus he is eligible to serve under both the Class "A" Vocational Credential and Industrial Arts. He has completed the requirements for his supervisory and co-ordinator credentials essential to his new position.

F. M. KREML PROMOTED

Franklin M. Kreml, director of the Transportation Center at Northwestern University, has been promoted to the rank of brigadier general in the organized reserve of the Army Transportation Corps.

He is commanding officer of Headquarters and Headquarters Company, 425th Transportation Highway Transport Command, in Chicago.

Mr. Kreml, who has served as director of the Traffic Institute of Northwestern University and of the Traffic Division of the International Association of Chiefs of Police since their establishment in 1936, is currently on leave of absence from this post to direct the Transportation Center.

Mr. Kreml entered the army as a volunteer in July, 1942, with the rank of captain; he has served in numerous capacities, and was the recipient of many military awards.

NEW FACULTY MEMBERS APPOINTED

Eight new faculty members and a researcher have been appointed to the staff of Illinois Institute of Technology, Chicago, Ill.

They are Dr. Natalis H. Polakowski, associate professor, metallurgical engineering; Dr. Linvil G. Rich, associate professor, civil engineering; Dr. Ti Yen, assistant professor, mathematics; Dr. Curtis N. Sandage, instructor in biology; Seymour Gray, instructor in accounting; Robert Henry Kuckelman, technical drawing instructor; Dr. Morris Aderman, psychology instructor; William S. Sherman, product-design lecturer; and Edward G. Thurston, research associate at IIT's Parmly Foundation for Auditory Research.

CHANGES AT LONG BEACH STATE COLLEGE

Leonard Torres will join the staff of industrial-arts teachers at Long Beach State College, Long Beach, Calif., in September, 1956. He will be teaching drafting and graphic arts.

He has been chairman of the industrial-arts department at Bellflower High School for several years.

Mr. Torres received his bachelor's degree from the University of California at Santa

Teacher's pet . . .

HOSSFELD UNIVERSAL® IRON BENDER

Wrenchless Type — Model # 1
Bends Flat, Round, Bar, Angle, Pipe

Samples of Bar Bending

HUNDREDS of shop instructors in vocational training departments of schools and municipal, state and government institutions are sold on the merit and utility of the Hossfeld Bender. Their maintenance departments, too, recognize it as practical and indispensable in the shop as a bench vise, capable of replacing a half dozen special machines. Proved in thousands of factories and repair shops as well, the Hossfeld Bender will neatly, quickly and accurately teach your students the 101 different bending jobs that they will be called on to perform in repair, maintenance and production work. For a better bender — specify Hossfeld.

SPECIFICATIONS

#1 Bending Capacities
Standard Pipe & Conduit — up to 1½" I.D.
Heavy Bends, Direct on Center Pin; "U" Bends on Cam Dies, 3" x 7/16" flat or ⅞" Round or Square Cold
Sharp Square Bends — 3" x ¼" Cold
Ornamental Iron Work — 3" x 3/16" Flat or ½" Round or Square, Cold
Eye Bolts — ½" Round or Square, Cold
Angle Iron — 1½" x 1½" x ⅛", Cold
Automobile Spring Eyes — 3" x ⅝", Hot
90° Bends on Conduit, Heavy Wall, or Standard Pipe — 1" Cold

GET THE FACTS! Write today for illustrated bulletin.

HOSSFELD MFG. CO.
438 W. 3rd Street Winona, Minnesota

Barbara, and his master's degree from Oregon State College.

Joseph Thomas, chairman of the industrial-arts department at Lewzinger High School in Inglewood, Calif., will be in charge of the woodworking area at Long Beach State College, starting in fall, 1956.

He has his undergraduate degree from Washington State College, Pullman, Wash., his master's degree from the University of Southern California, and is currently working on his doctor's degree at the University of Missouri.

Russell Journigan, radio-electronics instructor at Pasadena City College, will teach at Long Beach State College during the coming school year. He will assist in further developing the electronics program at the college.

Wilbur Farr, radio-electronics instructor at Long Beach State College, Long Beach, Calif., has been granted a year's leave of absence to attend the University of Missouri. He will complete his residence requirement for his doctorate and teach in the engineering department at the university.

♦ Dr. Harry Gunderson has been appointed Professor and Head of the Industrial Arts Division at Northern State Teachers College, Aberdeen, S. Dak., effective September 4, 1956.

♦ John Plummer, formerly of Southern Illinois University, Carbondale, Ill., and James LaRue, who has been working on his doctorate at Pennsylvania State College, have been added to the Industrial Arts staff at Iowa State Teachers College, Cedar Falls, Iowa. They are beginning their duties in September, 1956.

♦ The following industrial education majors were initiated into Pi Chapter of Iota Lambda Sigma at Northwestern State College of Louisiana: Dewitt Duncan, Robert Wilson, Osbon Blake, T. B. Wofford, Thomas Blankenship, Marvin Jones, Hubert Triplett, Jr., Leon Odom, Will Cates, Bill Cates, and W. C. Haddox.

♦ Dr. Roland F. Nagel, formerly associate professor of industrial education, Northwestern State College, Natchitoches, La., will assume new duties this fall when he joins the staff at Northeast Missouri State Teachers College, Kirksville, Mo.

He will be responsible for inaugurating a graduate program in industrial education at the Kirksville College. Dr. Nagel is a native Missourian and received the doctor's degree at the University of Missouri.

♦ Carroll A. Osborn, editor of the Michigan Industrial Education Society Newsletter, is now Assistant Professor of Industrial Education and Applied Arts at Michigan State Normal College.

♦ Rex Smelser, director of the Sowela Vocational-Technical School, Lake Charles, La., was a member of the summer faculty in the department of industrial education at Northwestern State College of Louisiana.

♦ Bill Shaw, an honor graduate from Northwestern State College of Louisiana, who majored in industrial arts, will return in September and start on his graduate work. He will also serve as a teaching assistant in the industrial education department.

♦ Waldemar E. Klammer, formerly of Truman High School, Truman, Minn., will be teaching at Western Michigan College, Kalamazoo, Mich., starting in September, 1956.

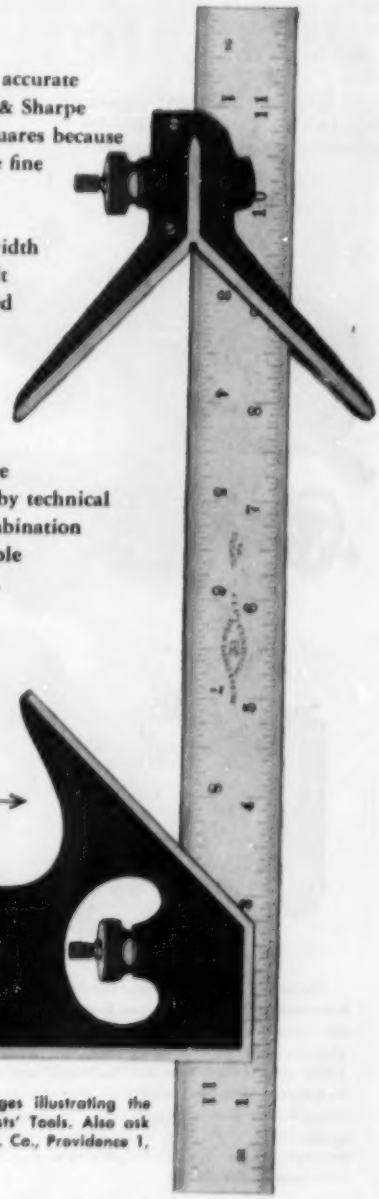
♦ J. H. Bailey, formerly at the Middle Tennessee State College, Murfreesboro, Tenn., is now teaching at Central Michigan College, Mt. Pleasant, Mich.

Nearly 70 colleges and universities are using closed circuit television as a part of their instructional procedures. — *Edpress News Letter.*

Graduated with Distinction...

these "clean-cut" scales aid student accuracy

Students make faster, more accurate measurements with Brown & Sharpe Rules and Combination Squares because *all* the graduations on these fine tools stand out clearly . . . easily readable. Every subdivision is of uniform width and depth . . . a *distinct* unit of length, machine graduated in highest quality steel for lasting accuracy. In addition, every blade is exactly the length it should be . . . a full measure of precision. Rules are available in every style and size used by technical students and craftsmen. Combination Squares and Sets are adaptable to the widest variety of uses.



No. 306A Flexible Steel Rule graduated in 32nds and 64ths. Available with leather case if desired.

All Brown & Sharpe Combination Squares feature the exclusive reversible bolt which permits use of either side of blade. No. 402, shown at right, available with 6", 9", 12", or 24" blade.

WRITE FOR NEW CATALOG 135 — 48 pages illustrating the complete line of Brown & Sharpe Machinists' Tools. Also ask for free training aids. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

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CAREERS IN CONSTRUCTION

ERNST H. SUERKEN

Supervising Principal
Union Free School District,
Greenburgh No. 11
Dobbs Ferry, N. Y.

The building construction or shelter industries embrace the second largest segment of American life, second only to that of agriculture and the food groups.

The building industry represents in reality two industries — heavy construction and light construction:

Heavy construction may be segregated as including roads, railroads, canals, dams, factories, public and office buildings, which require heavy construction machinery for erection. In dollar value such projects run from $20,000 up to hundreds of millions of dollars on a single contract.

The light construction industry on the other hand embraces homes, farm buildings, stores, garages, small industrial buildings of all kinds and the general field of structural repair, remodeling, and improving. The dollars and cents value of contracts in this division of the industry runs from $1 to $20,000 or more and the largest single item is, of course, the American home.

In normal years the housing industry, or to use its other name the light construction industry, is equal to the heavy construction industry as each division represents about 50 per cent of the total construction value.

The light construction industry has three major markets: that for new homes, that for structural improvements, and that for farm buildings. It has seven supply divisions; those of machinery, materials, labor, land, utility, credit and equipment and paralleling management divisions in production, distribution, finance, installation, and marketing.

The Dictionary of Occupations lists 1200 separate occupational classifications in the construction trades alone embracing a minimum normal employment of at least three and one half million men. At least another million are normally employed in the building industry, manufacturing establishments, and still another million in the distribution and service industries.

The one hundred separate industries covered in the following listing, which together make up the building industry in total, indicate the wide and varied opportunities for careers in construction.

The building industry uses the term *Housing Arts* to designate all the techniques and skills involved in the designing, planning, selling, erection, equipping and financing of homes, farms, farm structures, small industrial buildings and the renovation or alteration of existing structures.

We are concerned here with the field of housing and light construction which in itself constitutes an enormous and vital segment of our economic life.

There is a total of more than 2000 types of jobs under the following industrial classifications:

Abstract and title companies
Air conditioning
Aluminum products
Appraisers
Architecture
Asbestos products
Asphalt products
Building industry association
Banks
Barn equipment
Blowers and fans
Brass products
Brick and structural tile
Brokers
Building trades (61 types)
Building and loan associations
Building department executives
Cabinets
Cement
Chain store operator
Clay products (tile and pipe)
Concrete products
Contracting (14 types)
Construction machinery
Copper building products
Cork products
Cut stone and marble
Education and training divisions
Electrical apparatus
Elevators-escalators
Federal Housing Administration
Financing
Fireplaces
Floors — floor coverings
Furniture
Glass
Government service
Gypsum products
Hardware
Heating apparatus
Home loan banks
Home Owners Loan Corp.
Housing authorities
Housing consultant
Housing tax expert
Incinerators
Insurance
Investment banking
Insulating board
Insulation
Labor union officials

(Continued on page 30A)

THE *Nichols* TOOL ROOM MILLER

"the miller that uses its head!"

A valuable accessory is the Nichols Heavy-Duty Vertical Milling Attachment. Takes full 10 H. P. up to 3000 R. P. M. (In practice, some shops use it for [illegible])

CONDENSED SPECIFICATIONS

Table Working Surface	9¼" x 50"
Longitudinal Travel	30"
Transverse Travel	7"
Vertical Travel — Knee	12½"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to 3000 R. P. M.	
Weight	1250 lbs.

The unusual versatility and extra capacity of this model make it extremely useful for the tool room. Because it is equipped with the "rise-and-fall" spindle, it can perform not only conventional precision milling, but also facing boring, key seating, contour milling and other operations. Both longitudinal and transverse feed screws are fitted with hand wheels and extra-large adjustable micrometer dials with easy-to-read graduations. This model is especially useful because of its compactness, generous capacity and ability to handle a wide variety of work to close tolerances — to "tenths" when desired!

Write today for Nichols general catalog which describes the six models of Nichols Millers. A sound, color movie, "The Miller that Uses its Head" is available for free showing. May we reserve it for you?

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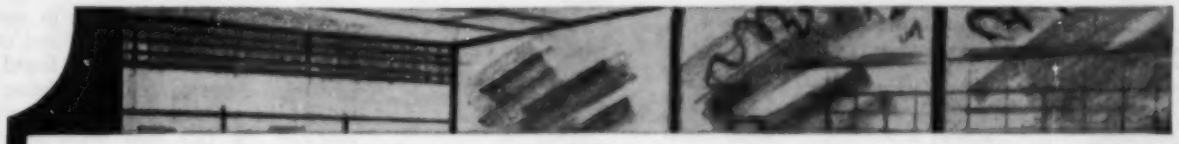
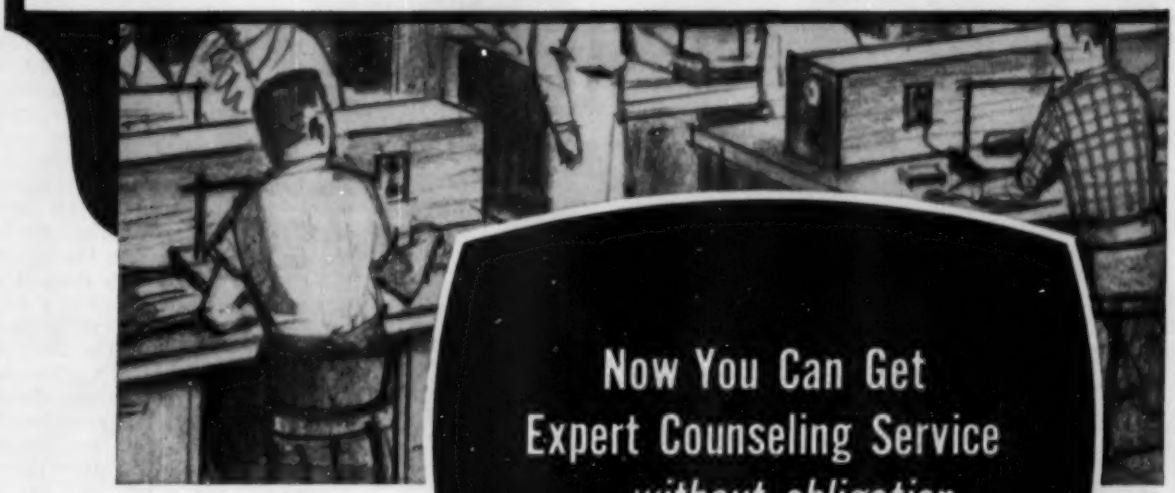


Planning a new electrical shop? Remodeling or expanding your present shop?



Now You Can Get Expert Counseling Service ... *without obligation*

● Designing and equipping an electrical or electronics shop can be a costly, complicated business, full of pitfalls for the unwary. It calls for expert guidance, something that has been nonexistent where such shops are concerned.

Now steps have been taken to remedy this situation, Crow Electri-Craft has established a new SCHOOL COUNSELING SERVICE—the only one of its kind anywhere—to help you outfit your shop with the equipment that best meets your needs . . . and to insure that you get maximum value for every dollar spent.

Why Crow Is Able to Offer This Unique Service

For more than two decades, Crow Electri-Craft has worked to bring more and better electrical and electronic instruction to secondary schools. Crow's famous "learn by doing" Electri-Kits have played an important part in this crusade. The wealth of practical experience gained over this long period gives Crow an intimate acquaintance with the problems of setting up an electrical shop. Now . . . without cost or obligation . . . your school can take full advantage of this experience.

You Furnish the Walls . . . We'll Do the Rest

If yours is a new school plant, or if you are adding an electrical shop to your present facilities, Crow will supply detailed recommendations for the *complete* shop—including wiring, conduits, power supplies, workbenches, meters, instruction equipment, manuals and course outlines. Equipment will be recommended scientifically on the basis of present enrollment, anticipated growth, student age and proficiency level, scope of curriculum, and physical size of shop.

If your present appropriation does not permit a complete shop installation, Crow will plan a *basic* shop that will best fulfill your current requirements and allow for future expansion as additional funds become available.

You can also take advantage of Crow Counseling Service when *remodeling* or *expanding* your present shop facilities.

In any case, Crow consultants will work with you or your architect to provide your school with a *practical, highly integrated* shop that will prove its soundness of design for years to come.

TO AVAIL YOURSELF OF THIS SERVICE—write Dept. 336G for School Counseling Service questionnaire.

CROW ELECTRI-CRAFT CORP.
Division of Universal Scientific Co., Inc.

1102 Shelby Street
Vincennes, Indiana

CAREERS IN CONSTRUCTION

(Continued from page 28A)

Landscaping
Lead products
Lighting fixtures
Lime
Linoleum
Logging
Lawn and garden furniture
Lumber
Mails
Manufacturing
Metal doors, frames, trim
Mineral wool
Mortgage companies
Nails and spikes
Nonferrous metals
Oil burners
Operator builders
Paints and varnishes
Paper — paper board
Partitions and store fixtures
Planing mills
Plastics
Plumbing
Plywood
Quarries
Radios
Real estate
Refrigeration
Research agencies
Retail lumber
Retailers
Roofing materials
Rubber products
Sash doors and millwork
Sand and gravel
Saw mills
Saws
Screens
Screws
Sheet metal
Steam fittings
Steel (structural)
Stokers
Stoves and furnaces
Structural and ornamental iron
Terra cotta
Tools and equipment
Trade unions
Utilities
Veneers
Wallboard
Wallpaper
Weather stripping
Wholesalers
Wire and fencing
Wiring devices and supplies
Wood preserving

Economists have long been in agreement that the answer to full and continuous employment is to be found in rebuilding America and in assisting to rebuild the world. But, economists often overlook the fact that work projects utilizing materials and labor seldom generate themselves. There must be a dynamic project-creating element in an industry to insure operation at peak capacity.

Why hasn't the building industry developed this element before? The answer to this question lies in three fundamentals: (1) For generations our country has been expanding construction-wise creating an automatic demand for building projects. In those generations it was not necessary for the building industry to provide a dynamic merchandising effort. (2) Our rate of population growth fluctuates — declines, remains stable, upsurges. Consequently there are fluctuations in demand and volume. Yet the need for created volume remains if we are to achieve the goal of full employment. (3) The home and farm building industry is primarily a local industry. For efficiency the light construction industry requires local integration, co-ordination, and organization such as other industries have on a national scale. A beginning has been made in the area of prefabricated homes and farm buildings where it has been possible for the prospective consumer to secure *one stop* service in terms of homes and farm buildings.

There is an opportunity here for trained men and women who will educate and serve the consumer of the light construction industry by developing local organizations which will make it unnecessary for the consumer to go about securing his needed building project "the hard way." It is suggested that the young man or woman who is in process of deciding on a career should study the splendid possibilities of the light construction industry — home building, structural improvements, and farm buildings — and compare them with the rewards of any other lifework under consideration.

can't stop looking at Hamilton's new arts and crafts equipment!

And neither will you! This beautiful, big 64 page catalog describes Hamilton's new line of school equipment for fine and applied arts instruction . . . for a wide range of storage needs . . . for mechanical drawing classrooms . . . for school shops — all with appropriate planning suggestions.

You'll find an entirely different approach to the requirements of arts and crafts instruction — equipment that brings the very look of creativeness to your instruction centers. In the development of this broad, new line an appealing balance has been achieved — a blending of Hamilton's detailed knowledge of school equipment needs, with an entirely new freshness of form, material and color. We think you'll find the end result attractive and well worth knowing about.

Whether your interest is in arts and crafts equipment, mechanical drawing, shop or all-purpose storage — you'll surely want to see Hamilton's new Catalog 219. Write for your copy now.

Ready for you now! 64 pages, with full color illustrations of selected products, finishes and colors. Write today!

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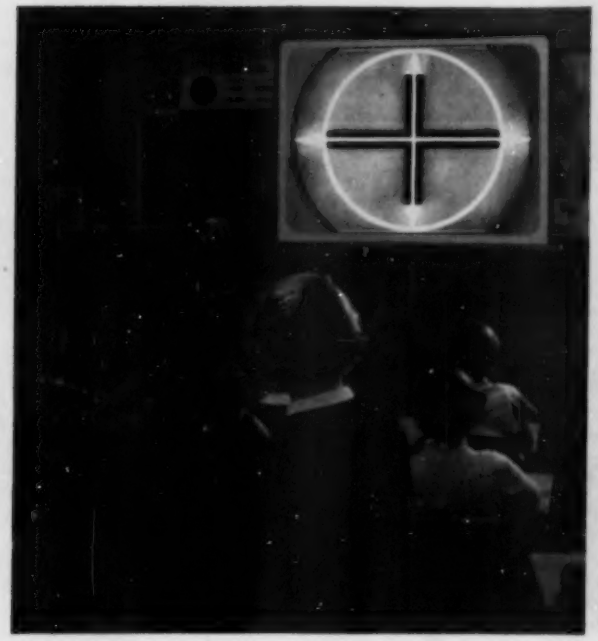
WOOD YOU REMEMBER

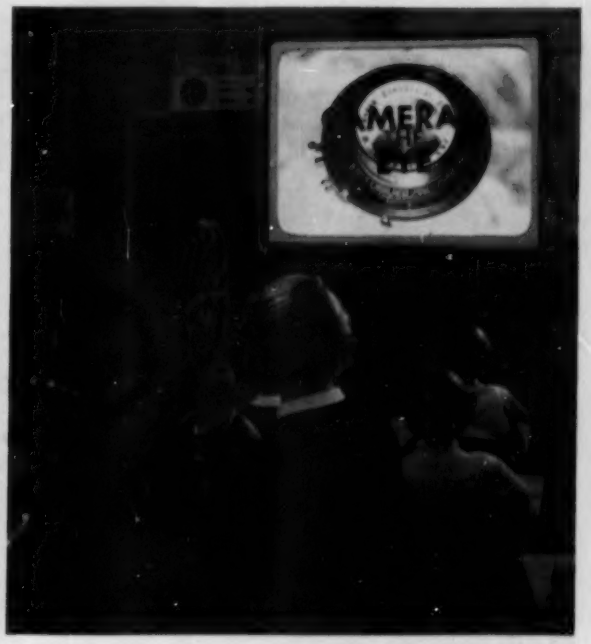
LAWRENCE W. KUNKLE
Cheltenham High School
Elkins Park, Pa.

A well-informed mechanic and craftsman should know the physical characteristics of the materials he uses. A knowledge of the various woods available to the woodworker is especially valuable. As we consider these characteristics, we realize how important they

(Continued on page 32A)

Where do your movies start here...or...here?





Disturbing—that's what it is when those focusing numbers flash across the screen and distract your audience right at the *start*.

But you don't have to begin that way, not with the NEW Kodascope Pageant 16mm Sound Projector.

With the Pageant's NEW single-switch reversing you run a few feet of film to check threading, focus, and sound level. Then you flip the switch and back up to the first title frame. When you're ready to turn off the lights, you *start* with the *opening scene*.

Single-switch reversing also lets you *re-run* important frames for emphasis, a helpful feature with classroom movies.

And, this easy reversing is just one of many important advances you'll get with your portable Pageant. It's just one *more* reason why a Pageant takes the "project" out of projection, helps you make the most of every showing.

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And ONLY a Pageant gives you:

1. Easy setup—Folding reel arms, attached belts, and printed film path, to make projection easy even for the inexperienced.

2. Freedom from worry over breakdown and maintenance. Your Pageant is lubricated for life, ending the most common cause of projector difficulty.

3. Superb sound quality—Tone and volume controls team with well-baffled speaker to give comfortable, true, useful sound for all types of rooms.

4. Bright screen images—Super-40 Shutter automatically puts 40% more light than standard shutter on screen at sound speed. Pictures sparkle, even with room lights on.

Choose your Pageant from one of 3 models. And get the facts first. Send for this free booklet giving details. No obligation, of course.

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10-103

Please send me complete information on the new Kodascope PAGEANT 16mm Sound Projectors, and tell me who can give me a demonstration. I understand I am under no obligation.

NAME_____ TITLE_____

ORGANIZATION_____

STREET_____

CITY_____ STATE_____
(Zone)

Kodak
TRADE MARK

WOOD YOU REMEMBER

(Continued from page 30A)

are. Consider these examples — white pine or balsa would be used where light *weight* is required; maple because of its quality of *hardness* makes a long wearing surface; aromatic cedar is used in the construction of a blanket chest because of its moth-resisting *odor;* cypress is suitable for exterior structures because of its natural *moisture* resisting qualities; the open or close grain creating a fine or coarse *texture* is always a factor; red gum because of its *color* is a suitable substitute for walnut; and the quality of *resonance* possessed by some woods are the primary consideration in the making of musical equipment.

Let us make use of the law of association to implement our learning and memory. A novel way to remember the physical characteristics of wood is to arrange the first letter of each characteristic in an order easy to recall.

The order is WHOMTCR — whom tcr. Try it with your students.

W — weight
H — hardness
O — odor
M — moisture resistant
T — texture
C — color
R — resonance

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Tucson Public Schools
Tucson, Ariz.

In response to demands from many sources we are offering a course in the fundamentals of making good movies. This course will be especially valuable to the new owner of a movie camera, the beginner who wants to learn how to make good movies. It is not a course designed for the advanced movie photographer.

Movie photography is one of the most interesting and profitable hobbies, and as a hobby it is second to none.

This course has been planned, as far as possible, so that the different lessons follow in logical order, and one subject will lead to another. The demonstration — lecture form of instruction, learning by doing will form the core of the course. Lectures, demonstrations, and reviews of the students' movies will be presented at most meetings.

The registration fee is $10 for 15 weeks. The course will be presented every Wednesday evening from 7:00 to 10:00 p.m. At the time of registration, each student also pays for one roll of film for his movie camera. The film will be given to the student at the proper time to shoot his movie of *Tucson*.

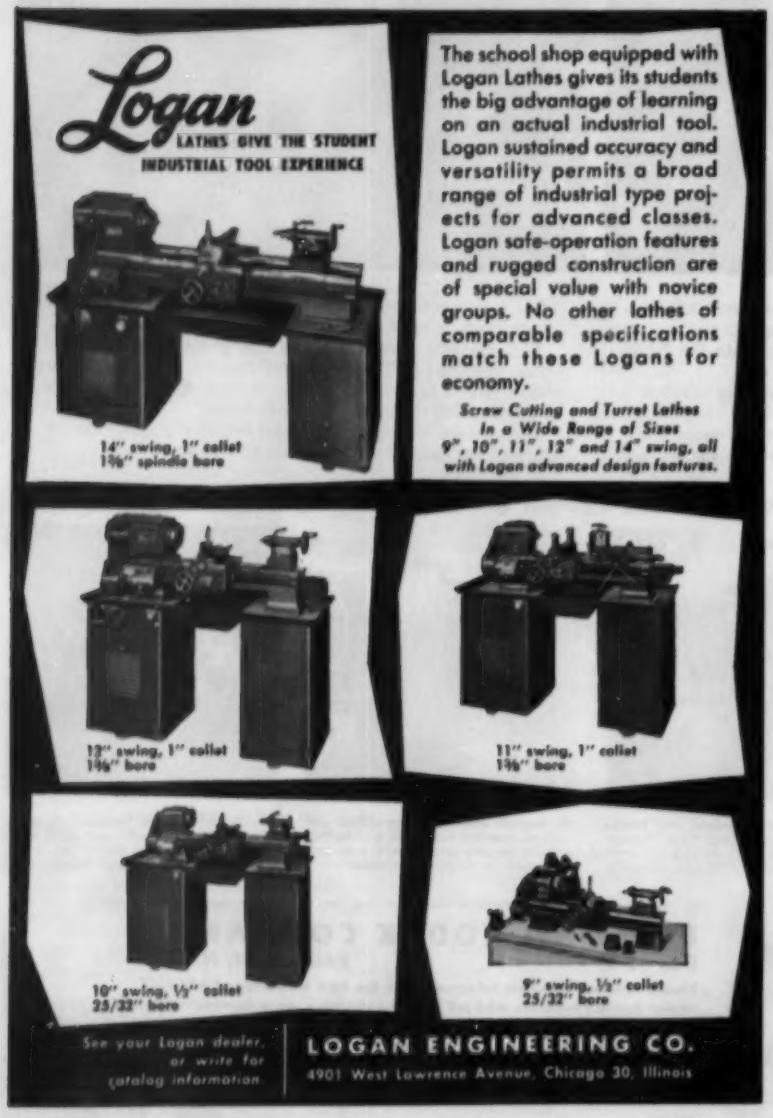
Outline of the Course

1st week: To learn how to operate a movie camera, how to select a camera to fit the students' needs, and the differences between 8mm. and 16mm. cameras. Review of students' movies.

2nd week: To learn how to use equipment other than the camera to produce good movies. A guest speaker will tell how to take good movies of a parade and rodeo movies. Review of students' movies.

3rd week: To learn how to determine the correct exposure in making color, and black and white movies, what filters to use, and how to determine what is the correct lighting. A guest speaker will tell the truth about movie lenses. Review of students' movies.

(Continued on page 35A)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An entirely new revision of the most complete general metalwork textbook ever published. Text describes tools, materials and operations common to many metal-working occupations. 662 illustrations make it interesting and useful for high school and junior high use. Huge index with over 4,000 entries, completely cross-referenced.

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Carving panels by Ken Griffin

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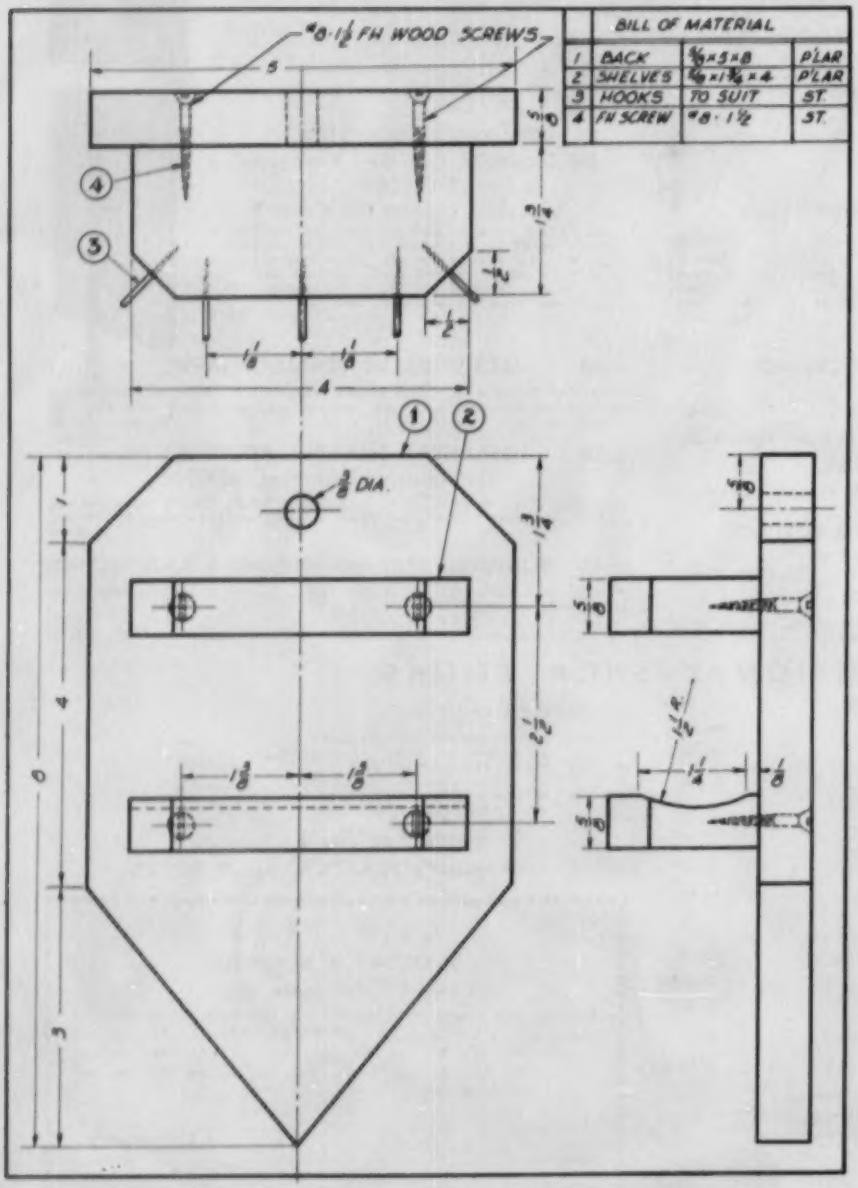
TOOTHBRUSH AND TOOTHPASTE HOLDER

ALFRED M. REINHOLD
Atlanta, Ga.

The project illustrated and described herewith is a simple article which requires very little material, and takes but a short time to make. It may be made of poplar wood.

Method of Procedure

1. Square all three pieces.
2. Lay out and cut corners and trough, and bore all holes.
3. Fit parts together, then disassemble and sand with 3/0 paper; dampen, allow to dry, and sand again with 3/0 paper.
4. Stain all pieces. Allow to dry.
5. Reassemble with glue.
6. Give the whole three coats of shellac, sanding between each coat with worn 3/0 sandpaper. Final sanding should be done with 6/0 paper.
7. Wax and polish.



Detailed drawing of the toothbrush and toothpaste holder

THE LAG IN INDUSTRIAL EDUCATION AND INDUSTRIAL APPLICATION

ROBERT JONES
Chicago, Ill.

The emphasis in industrial drafting rooms today is on "time." Time saved in the drafting department reflects on the over-all productivity of the entire organization. That is why simplification in drafting practices is being encouraged by industry. After all, the end result of design and drafting is fabrication, erection, and operation, not graphic or art presentations.

The serious effort being made today in industrial education to develop skills and knowledge of graphic presentation is welcomed as the fundamental step, because industry recognizes that the three prime characteristics of a good draftsman are accuracy, speed, and neatness. Yet the achievement of the drafting department — the original drawing — seldom if ever reaches the production departments. It is the blueprint, the Vapo print, or other forms of reproductions of the original that the shop uses in fabricating the part.

The Lag Between Industrial Education and Industrial Application

When a student enters industry for the first time, he lacks the basic understanding of the end use of his drawing. Without this knowledge, the neophyte draftsman very understandably cannot appreciate why he is taught the importance of the proper choice of tracing mediums, the correct degree of pencil, and the right weight of line, all of which are so vital to a good legible shop print, and are equally as important to his employer from the standpoint of time as accurate graphic presentation. But regrettably this all-important phase of industrial education is too often completely overlooked or only discussed briefly with the students.

With today's compact reproduction equipment, there is no reason why a basic understanding of the end use of a drawing cannot be an integral part of the industrial education curriculum.

Saving Drafting Time Through the Use of Intermediates

Print making is an education in its own right, and unless the student wants to become proficient in print making, extensive specialized knowledge is superfluous, yet it is essential for him to become familiar with what is being done in drafting rooms in using intermediate reproductions to save drafting and retracing time. An intermediate is any translucent base reproduction master printed from an original drawing in order to permit modifications economically and to serve as the basic source of print making.

Drafting educators should familiarize themselves with the various techniques involved in this phase of modern drafting practice. Many methods, changes, deletions, and additions to original drawings can be made without ever touching the original.

Some of the most popular current uses of intermediates for this purpose are discussed in detail in a 16-page booklet, "11 Ways to Save Drafting Time," recently published by Frederick Post Company, 3650 North Avondale, Chicago 18, Ill.

Drafting teachers will derive great benefit by studying this valuable little booklet.

MAKING GOOD MOVIES

(Continued from page 32A)

4th week: To learn different camera techniques, length of scenes, and camera angles. A simple scene will be shot with all students participating as cast and crew. Review of students' movies.

5th week: To learn how to use trick and effect photography for good movies, also how to take movies at night. Review of students' movies.

6th week: To learn how to use continuity and its importance in making movies, and what devices to use in making different types of stories come to life. Review of students' movies.

7th week: To learn how to follow action, avoiding jump cuts and overlapping actions, use constant screen direction, cut in, and editing in the camera. Review of movie equipment. Students will begin plans to shoot their movie *Tucson*. Script will be given to class.

8th week: To produce a simple play the students will work out all problems, story board, shot breakdown, pictorial continuity, and script. Students will have an opportunity at being camera man, grip, script, prop, and actors.

9th week: To continue production of class play movie.

10th week: To complete production of class play movie.

11th week: To edit the class movie and learn the problems involved.

12th week: To title the class movie and learn the problems involved.

13th week: Show time: To begin a review of each student's movie *Tucson* with comments from class on possible improvements. Special information on projection technique to make your showtime more professional.

14th week: To learn how to be your own director or *a person of many talents*. Review continued of "Tucson" movie.

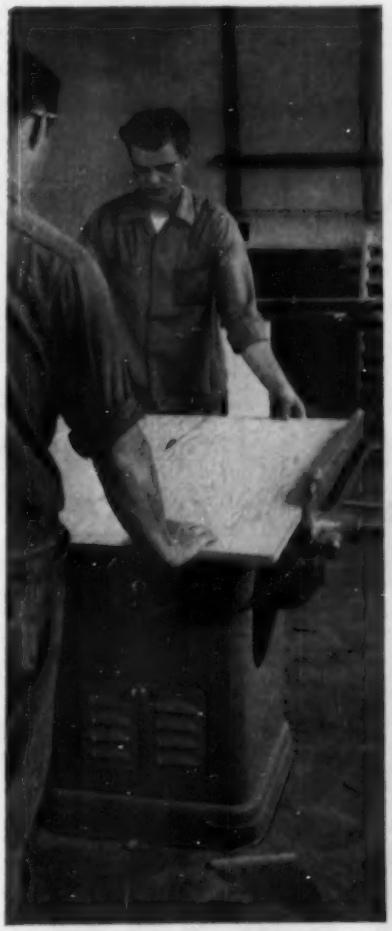
15th week: Review of new products and things to come.

Script for "Tucson"

A one reel movie photographed by .....
Film needed — 100 ft. of 8mm. or 200 ft. of 16mm. in color.
Total shooting time about 310 seconds–5 min. 10 seconds.
Title "Tucson" (10 sec.)
Photographed by ..... (15 sec.)

1. Close-up of sign on highway leading to city (10 sec.)
2. Long shot from "A" mountain taken about 4 p.m. either slow pan or series of shots (20 sec.)
   Med. long shot east on Congress Street from Congress and Stone (8 sec.)
   Close-up signs (Jacome's, 4 sec.) (Pioneer Hotel, 4 sec.)
   (El Con., 4 sec.) (Biltmore Motor Court, 4 sec.)
3. Title "Summer Sports in the Winter!"
   Long shot showing swimmers at Biltmore, 6 sec.

(Continued on next page)



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☐ UTILITY SHELVES	☐ TRAIN TABLE CABINET	☐ 15' SAILBOAT
☐ TOOL-CABINET WORKBENCH	☐ COVERED SAND BOX	☐ 20' SAILBOAT
☐ DOUBLE DUTY DESK	☐ TOY STORAGE BLOCKS	☐ 11'3" OUTBOARD
☐ COFFEE TABLE	☐ PORTABLE GARDEN CADDY	☐ 9' FLAT BOTTOM DINGHY
☐ BEDSIDE TABLE	☐ SECTIONAL PATIO TABLES	☐ 7'9" PRAM DINGHY
☐ STUDENT'S DESK	☐ OUTDOOR SERVING WAGON	☐ 13'4" OUTBOARD
☐ CHEST OF DRAWERS		☐ 13'6" INBOARD RUNABOUT
☐ TWO-DOOR CABINET	☐ SUN SLED	☐ HOG HOUSE
☐ TV STOOLS	☐ GARAGE STORAGE BOX	☐ POULTRY HOUSE
☐ CHILD'S TUMBLER	☐ GARDEN CABINET	☐ ROLL-AWAY POULTRY NEST

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MAKING GOOD MOVIES

(Continued from previous page)

Medium shot showing swimmers at Biltmore, 8 sec.
3 close-up showing swimmers at Biltmore, 4 sec. ea.
Long shot showing horseback riding in the desert, 6 sec.
Med. shot showing horseback riding in the desert, 10 sec.
Close-up showing horseback riding in the desert, 10 sec.
Long shot showing shuffleboard in Armory Park, 10 sec.
Med. shot showing shuffleboard in Armory Park, 6 sec.
Med. shot showing low angle puck toward camera, 10 sec.

4. Title "Good Schools"
Long shot Elementary school with pupils in yard, 10 sec.
Med. shot Elementary school with pupils in yard, 15 sec.
Close-up Elementary school with pupils in yard, 15 sec.
Long shot Tucson High athletic field with sport going on, 8 sec.
Med. shot Tucson High athletic field with sport going on, 8 sec.
Close-up Tucson High athletic field with sport going on, 8 sec.
Long shot of University grounds with students walking, 10 sec.
Med. shot of University grounds with students walking, 10 sec.
Close-up of University grounds with students walking, 10 sec.

5. Title "Scenic & Historical Landmarks"
Long shot of San Xavier Mission, 12 sec.
Med. shot of San Xavier Mission, 10 sec.
3 close-up of San Xavier Mission, 6 sec.
Close-up of sign to Saguero monument, 10 sec.
Long shot of Saguero cactus forest, 10 sec.
2 close-up of end of Saguero cactus, 10 sec. ea.

Total, 310 sec.

Balance of movie roll on subjects of particular interest to student.

Critique Sheet

Title of movie .....
Made by .....
Story selection: .....
Set: .....
Location outdoors: .....
Acting: .....
Make-up: .....
Properties: .....
Lighting: .....
Exposure: .....
Camera operation: .....
Trick and effects: .....
Continuity: .....
Editing: .....
Titling: .....
General comments on making a better job of this movie:
.....
.....

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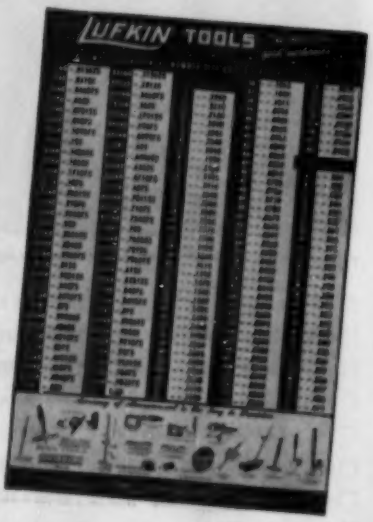

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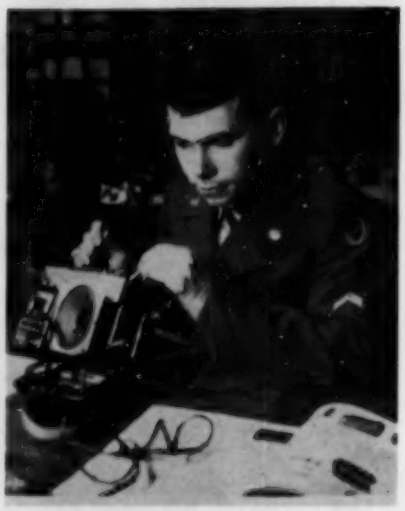
CAMP DRAKE ARMY CRAFT SHOP

RICHARD H. ADAMS
Madison, Wis.

The Camp Drake (Japan) Crafts Shop is housed in a building 60 by 38 ft. with an attached sales storeroom measuring 18 by 9 ft. In the building are 26 double outlets for the power tools, soldering irons, kilns and enlargers which are used. Light is provided by 200-watt incandescent bulbs at 12-ft. intervals and 8 ft. from the floor.

The staff of the Camp Drake shop includes an army crafts technician and three Japanese craftsmen. The army crafts technician's duty is the organiza-

(Continued on page 38A)



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CAMP DRAKE CRAFT SHOP

(Continued from page 36A)

tion, promotion, and maintenance of the shop facilities and instruction in the various crafts. The indigenous personnel include a photographic technician, a crafts technician whose main duty is instruction in model building, and a sales clerk whose responsibilities are sales of crafts supplies and issuance and maintenance of tools.

At present, major interest remains with model building, the photo laboratory, and leathercraft. Model airplanes are very popular with the Japanese people and on the local markets are found several very good Japanese engines. One of these is exported to the United States.

The emphasis in leathercraft is on the carving of vegetable tanned cowhide and calf using the swivel knife and popular saddle stamps, rather than the tooling of art leathers with a modeling spoon. Since hand-tooled purses make nice gifts and are unbreakable during shipment and relatively small, many are made in the Camp Drake shop.

Japan is a very photogenic land and possibly the photo lab here is the most popular area of the Camp Drake shop. In the photo lab are four 2¼ by 3¼-in. enlargers, one automatic drum print drier, a small print drier, and trimmers, developing tanks, timers, etc. With the Japanese photo technician operating the lab, the problem of control of a two-room shop is solved.

Leathercraft and woodwork

Additional crafts having lesser interest are: ceramics, metal crafts, woodwork, internal carving of plastics, shellcraft jewelry, linoleum block printing, silk screen printing, fly tying, braiding and weaving, and drawing and painting.

Facilities for ceramics include a potter's wheel and a kiln and the necessary tools and glazes. Some interest has been shown in ceramics but as yet no proficiency in the use of the potter's wheel has been developed. Some sculpturing is being done, however, and it is felt that with the building of a display of ceramic projects, more interest will be shown in the potter's wheel.

The metal crafts which are offered allow the most diversified means of creative expression. Four phases of metal crafts have become popular: metal foil tooling, metal enameling, jewelry making from silver and copper, and the raising of bowls and similar projects from copper. Equipment for jewelry

(Continued on page 40A)

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To a teacher like yourself, ABC can mean many things – the alphabet, a new governmental agency, or part of a formula – but the ABC in the symbol above was born in 1914, at the same time as INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. And it is now having a great effect on your enjoyment of this magazine.

You see, ABC means *Audit Bureau of Circulations*, a non-profit, cooperative association of publishers, manufacturers and advertising agencies. This association rigidly audits the circulation (readership) of this magazine so that advertisers can know exactly who reads and PAYS for INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

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Good publishing is costly, but because of consistent advertising the publisher and editors of this publication give you a better magazine – more comprehensive in its coverage of the things which interest you, printed on good paper for your reading pleasure, and edited by professionals who are skilled in gathering and presenting the best possible articles, news and project material avaiable in the field.

The six-month audit report of the ABC also gives the editor an accurate picture of his readers, making it easier to keep his publication balanced in content so that every segment of readers will be served with articles and material in the many areas of industrial education.

Voluntary membership in the *Audit Bureau of Circulations* means high publishing standards. It means honesty with readers and with advertisers. It means a never-ending effort to publish a magazine which serves readers in the best possible way – year after year. Only in this way can an ABC publication grow and stay in business!

In this ABC month, the publisher salutes the readers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION who have made this magazine the consistent leader in the field by voluntarily subscribing and *paying* for their subscriptions.

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CAMP DRAKE CRAFT SHOP

(Continued from page 38A)

making and raising include jeweler's saws and files, sets of dapping dies, an acetylene soldering torch, alcohol torches, raising and planishing hammers and stakes. To date very little interest has been shown in jewelry making but spasmodic interest is shown in raising ash trays and simple bowls from copper disks. Perhaps the most popular metal craft in the Drake shop is the tooling of pictures in copper foil using a modeling spoon over a felt or sponge rubber pad. Many beautiful pictures have been tooled by this method.

Metal enameling facilities include two small kilns and a large assortment of enamels made of very finely ground glass. The process we follow consists of cutting out of copper brooches or earrings to be enameled, cleaning it thoroughly with acid and steel wool, and sprinkling dry powdered glass or painting the piece with the powder mixed with water. It is then placed in the kiln and fused to the copper at a temperature of 1200 to 1450 deg.

Woodwork at the Camp Drake shop is a minor interest due to the difficulties of shipping large projects home. In the past, woodworking interest has been confined to making furniture from packing crates, etc., with which to make living in the barracks a bit more comfortable. Some smaller articles have been built such as radio cabinets, jewelry boxes, and an occasional wood carving. Native Japanese woods are cheap and good, and it is hoped that interest in woodworking can be developed. Common woods here are rawan, a native mahogany selling for 15 cents a board foot, cherry, Hoh, a carving wood, and Kitty wood, a light wood used in model making and for Japanese wooden sandles.

Our facilities for carrying on woodwork are adequate. Power tools include a belt sander, a 12-in. band saw, a 24-in. jig saw, a drill press, and an 8-in. circular saw. Hand tools for woodwork are also extensive. They include planes to jointer size, bar clamps, chisels, etc.

Reference facilities and designs for leather carving are necessities here as in any industrial-arts shop. We have subscribed to eight home mechanics and crafts magazines, and have three racks of books on the various crafts. To solve the problem of storage of these, and to keep them easily accessible we have built a rack on the end of each workbench. We have also found that mounting leather tooling designs and other frequently used idea sheets on both sides of a clipboard gives them an indefinite life. If unmounted they are lost in a few weeks.

(Continued on next page)

METALCRAFTING
PROJECTS
Especially Suitable for VOCATIONAL EDUCATION

- ALUMINUM ETCHING
- STIPPLING
- COPPER TOOLING
- FOIL EMBOSSING

Looking for something new and different to offer your students this year? Introduce them to the art of metalcrafting.

With just a few simple directions even your most inexperienced students find it surprisingly easy to make beautiful trays, coasters, wall plaques, bracelets, and many other fascinating items.

The only basic materials needed are Metal Goods Corporation's sparkling Mirror-Finish Aluminum, or luxurious looking aluminum COLORCIRCLES . . . Metal Goods Corporation's Safe-T-Etch, non-acid etching compound . . . and Metal Goods Corporation's Hi-Temp Craft Black asphaltum paint.

MGC Aluminum Craft Circles are of the finest quality obtainable.

MGC Safe-T-Etch is the safer, faster etching compound which removes all of the objectionable features in acid etching.

MGC Hi-Temp Craft Black is the free-flowing, quick-drying, asphaltum paint that helps achieve cleaner, sharper etched lines in craft designs.

Metal Goods Corporation also has aluminum and copper embossing foils and tooling metals, and many other craft materials.

For additional information, send for descriptive literature and price list, today. No obligation, of course. Just tear out and fill in the coupon shown below. Your request will get prompt attention.

METAL GOODS CORPORATION

TEAR OUT AND MAIL COUPON TODAY

METAL GOODS CORPORATION: Craft. Div.
5247 Brown Ave., St. Louis 15, Mo. S

Gentlemen:
Please send FREE literature on making beautiful trays, coasters and other Craft items; also price list.
(Please type or print)

Name.....
Address.....
City..... Zone..... State.....

Source of supplies and equipment for the Camp Drake Craft Shop is threefold. Appropriated Fund Sources provide many power and hand tools to craft shops. Several kits containing tools and materials for specific activities such as metal tooling and braiding and knotting, etc., also are obtainable.

The source of tools and expendable supplies not available through appropriated fund sources, are purchased from the States and locally with money from the Army Welfare fund. This fund includes profits derived at the Post Exchanges and other sources which are granted to the various older welfare activities.

Another source of money for craft supplies for the soldier is the sales store in the crafts shop. The Camp Drake Shop has a revolving fund of $1,500 with which an inventory of kits and accessories is kept on hand for purchase by the participants. Included in this inventory are hides, leather kits, model kits, lacing, model accessories, and model airplane engines, photographic paper, silver wire and sheets, etc. Sales in the sales store at a manufacturer's price plus transportation costs total about $600 each month.

The popularity and effectiveness of this program is indicated by the attendance. For the four-month period, October-January, 1953–54, there was an average of 3350 persons per month, or a few over 100 persons using the shop in some way each day. It is very seldom that fewer than 20 to 30 soldiers are found working in the shop. Promotional efforts to build up attendance include posters on the bulletin boards of each unit and various contests. One such effort advertised two contests sponsored by the supervisors among the 17 shops in the Tokyo area. One was for Christmas cards produced in the shops either by photographic, silk screen, or linoleum block processes, and the other was for the best Christmas gifts made in the shops.

News Notes

NEW TUITION-AID PLAN

Aluminum Company of America has announced a new tuition-aid plan which will enable employees to undertake or continue college studies with company financial assistance.

The plan provides tuition reimbursement to a maximum of $200 per year for employees who wish to obtain a college education or proceed into advanced study. Courses of study must pertain to the employees' present or possible future work with the Company.

Administration of the plan will be handled by committees at each plant and district sales office. The plan is open to all Alcoa employees with the Company continuously

(Continued on next page)

NOW you can add COLOR TV to your courses of instruction

THE COMPREHENSIVE COURSE ON COLOR TV

only $6.95

ORDER BELOW

THIS BOOK IS YOUR IDEAL TEACHING GUIDE FOR EFFECTIVE COLOR TV TRAINING

"COLOR TV TRAINING MANUAL"

This comprehensive training course, written by Oliphant and Ray, clearly covers the entire subject of Color TV. Contents: **SECTION I:** Principles of the Color TV System (includes chapters on Colorimetry; Requirements of the Composite Signal; Make-up of the Color Picture Signal). **SECTION II:** Color Receiver Circuits (chapters on RF and IF Circuits; Video, Sync and Voltage Supply Circuits; Bandpass-Amplifier, Color-Sync and Color-Killer Circuits; Color Demodulation; Matrix and Output Circuits). **SECTION III:** Servicing the Color Receiver (chapters on Setting Up the Color Picture Tube; Aligning the Color Receiver; Trouble-Shooting; Test Equipment Required). Appendices include Equations, Vectors, Color-blocks, Colorplates, Glossary. A well-organized, effectively presented training course for advanced students in Electronics. 260 pages, 8½ x 11"; profusely illustrated. Order **TVC-1**, only..... **$6.95**

USE THESE LEADING TRAINING COURSES

RELY ON THE WIDELY USED **SAMS BASIC MANUALS**

"BASIC TELEVISION MANUAL." Here is the most comprehensive and valuable training course for instruction in Television. Organized as follows: **LESSON SECTION:** 24 lessons covering such subjects as Oscilloscope principles and application; power supplies; FM carrier waves, discriminators, ratio detectors; antenna principles and design; TV receivers; RF amplifiers and tuners; Video IF, detection and AGC; cathode ray picture tubes; sweep circuits, and other subjects. **PROJECT SECTION:** Describes 9 basic projects which demonstrate theory in action; they teach through actual, practical doing. 508 pages; illustrated; 8½ x 11". Order **ED-21**, only..... **$5.00**

"BASIC RADIO MANUAL." The widely used Training Course in Radio. Includes 36-Lesson Section covering basic radio theory, terms, circuits and symbols, components, test instruments, radio transmitting and receiving principles, etc. The 13-Project Section demonstrates theory in practical action by actual doing; includes construction projects, application of basic laws, soldering practice, construction, etc. Adopted as standard text by hundreds of schools. 248 pages; fully illustrated. 8½ x 11". Order **ED-1**, only..... **$5.00**

"BASIC ELECTRICITY MANUAL." This outstanding training course consists of 35 Lessons in Practical Electricity, covering basic theory, laws, terms, magnetism, motors, transformers, lighting, telephones and dozens of other subjects. Includes 13-Projects Section, outlining simple, inexpensive projects which demonstrate theory in practical action and which teach interestingly through actual doing. 264 pages; profusely illustrated; 8½ x 11". Order **ED-12**, only..... **$5.00**

FREE **TRAINING AIDS FOR INSTRUCTORS:** Write for our FREE "Planning Guide for Instructors" and Wall-Size TV and Radio Schematics—invaluable aids to instruction in Radio, TV, Electronics and Electricity.

order from **HOWARD W. SAMS & CO., INC.,** Indianapolis 5, Indiana

Order Your **SAMS MANUALS TODAY!** School Discounts Apply...

HOWARD W. SAMS & CO., INC., 2216 E. 46th St., Indianapolis 5, Ind.

Send me the following (with 30 day return privilege):

☐ copies "Color TV Manual" ($6.95) ☐ copies "Basic Radio" ($5.00)

☐ copies "Basic Television" ($5.00) ☐ copies "Basic Electricity" ($5.00)

☐ Send FREE Instructors' Aids

Name_____ Title_____

School_____

Address_____

City_____ Zone____ State_____

NEWS NOTES

(Continued from previous page)

for more than one year. Employees of less than a year's tenure may participate, but tuition rebates will be withheld until the minimum service requirement is completed.

DU PONT COMPANY ISSUES BOOKLET

Six scientific principles and six inventions that reshaped civilization are described in "Science in Industry," a new booklet issued by the Du Pont Company, Wilmington, Del.

The principles are Einstein's theory of relativity, Lavoisier's analysis of the composition of air, Newton's law of universal gravitation, Darwin's theory of evolution, Pasteur's theory of bacteria, and Copernicus' concept for the solar system.

The six inventions include: the airplane, the telephone, the steam engine, movable type, the automobile, and the clock with interchangeable parts.

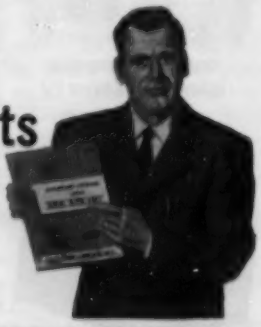
Also shown in the booklet are six of the great monuments to science and invention: the Roman aqueduct at Nimes, the Hoover Dam, the Empire State Building, the Panama Canal, the Savannah River atomic energy plant, and a Detroit automobile assembly line.

The 32-page illustrated booklet traces the rise of science from prehistoric ages, and shows how today the industrial organization is the chief means for co-ordinating scientific knowledge, invention, and technology to serve the needs of man.

Send For

"Electrical Requirements for High School Electric Shops"

(INDUSTRIAL ARTS LEVEL)



You should have Booklet No. 205 . . . *especially* if you are planning a new shop or re-vamping your present one. This booklet gives valuable suggestions; offers a shop layout plan and lists fundamental requirements.

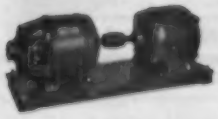
SAFE, TIMESAVING, UP-TO-THE-MINUTE EQUIPMENT

SERVICE UNIT

Typical bench unit for 2- or 3-wire variable service, 120 V a-c and continuity test circuit. Single or double faced. Many other types.

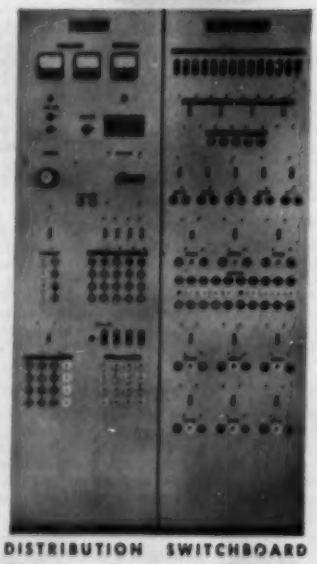
CONNECTOR CORDS

Other types furnished to meet requirements.



MOTOR GENERATOR

A typical machine for furnishing 125 V d-c. Furnished in any size required.



DISTRIBUTION SWITCHBOARD

This controls and distributes all the various a-c and d-c currents required for any work in the Electric Shop.

THE Standard ELECTRIC TIME COMPANY

127 Logan Street • Springfield 2, Massachusetts

INSTITUTE OF INTERNATIONAL EDUCATION RECEIVES GIFTS

A grant from the Ford Foundation of $3,500,000 to the Institute of International Education was announced recently. The grant was made toward the organization's ten-year goal of $8,400,000 for basic support.

The grant of $350,000 a year for ten years was announced by Arthur A. Houghton, Jr., chairman of the Institute Board of Trustees, and Kenneth Holland, President of the 37-year-old exchange agency. The sum, the largest single gift ever received by the Institute, will be used for the support and development of the organization's work in international education.

In addition to the above, the Carnegie Corporation has made a ten-year grant of $1,500,000 and the Rockefeller Foundation has made a five-year grant of $250,000 toward the support of the Institute.

The Institute is a private, nonprofit organization which this year is administering exchange programs involving more than 4500 individuals. It handles, under contract, many exchange programs for governmental and private agencies. The Institute was directly concerned with the sponsorship of one fourth of all the foreign students at the graduate level who came to the United States this past year. It secures financial support of more than a million dollars each year from private sources for carefully selected foreign students. It also nominated 1400 American college graduates for study abroad under the Fulbright and other public and private programs.

The Institute maintains regional offices in the United States in Chicago, Denver, Houston, San Francisco, and Washington, D. C.

INDUSTRIAL ARTS WORKSHOP

A special industrial arts workshop will be held on the campus of Stout State College, Menomonie, Wis., on October 19, 1956. Attention will be given to industry's view of industrial education and to three areas of industrial arts.

Describing the attitude of industry toward industrial education will be George R. Martins of the Falk Corporation, Milwaukee. Accompanying him will be Mr. Falk's chief draftsman who will speak on "Modern Drafting Room Techniques."

Displays, discussions, and demonstrations in three areas of industrial arts will be directed by members of the Stout faculty: upholstery, K. T. Olsen; general motor mechanics, Ernest Rawson; and aluminum forming, Edwin Dyas.

Dr. Herbert Anderson, chairman of the woodworking department at Stout State College, will be general chairman of the event. — *T. F. Fleming*, public relations.

♦ The Federal Prison Industries, Inc., Department of Justice, needs industrial foremen with supervisory or teaching experience in the manufacture of corn brooms, wood products, men's clothing and shoes, and in printing, typewriter repair, and machine die and tool work. The positions are located in federal prisons throughout the United States and pay from $4,080 to $4,970 a year to start.

Interested persons may obtain further information and application forms at many post offices throughout the country, from the United States Civil Service Commission, Washington 25, D. C., or from the Board of U. S. Civil Service Examiners, U. S. Penitentiary, Leavenworth, Kans. They should ask for Announcement No. 9-14-1(56). Applications will be accepted by the board of examiners at Leavenworth until further notice.

YOU CAN MAKE IT WITH

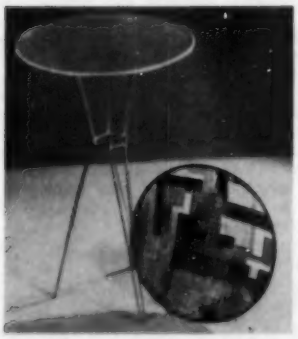
Castoglas

Casting Tiles for Trays

These seventh grade boys are pouring colorful tiles with liquid Castoglas. They learn all the basic steps . . . from mixing their own raw materials to creating the finished product. These tiles make exceptionally fine take-home projects that look really professional. Finished items vary in price from 25¢ to about $1.25. "How to Cast Tiles with Castoglas" gives complete directions for making trays, tables, coffee pot and plant tiles. Price of 10¢ includes *Free* copy of "Working with Liquid Castoglas in the School Shop."

YOU CAN MAKE IT WITH

Castoglas



Laminating Bowls and Tables

Decorative bowls, dishes, table tops, plant stands, bird baths and similar forms are easily and inexpensively made with Castoglas-treated glass fabrics, which can be silk-screened or painted with oils, tempera or water colors. Real leaves and butterflies may also be embedded in the glass mat or cloth, creating unusually beautiful effects. These and similar project techniques are described and illustrated in "How to Laminate Bowls and Dishes with Castoglas." Material cost is surprisingly low. The table shown costs $1.75, including the metal legs. Mosaic dish is valued at $35.00 but materials for it cost only $1.00. Send 10¢ for this popular CASTOLITER project folder.

WORKING WITH LIQUID CASTOGLAS IN THE SCHOOL SHOPS

ALL OF the projects illustrated on this page were made by 7th and 8th grade students. Shop teachers who have never done this type of work before may be just a bit skeptical, and perhaps justly so. These projects would indeed be difficult if conventional materials were to be used. But synthetic liquid resins do open to schools many procedures which up to now were known as impossible.

Why Are Synthetics Important in the school Shop?

There are several factors, one of which is their tremendous growth and present industrial volume, the very impact of which is an undeniable challenge to the school shop generally. Castoglas is a synthetic resin that lends itself especially well to shop work because of its ease in handling, and because it requires no heat or pressure.

The simplicity of working liquid plastics is quickly appreciated by the student. In his very first lesson, he learns the mixing of Castolite resins, Hardener, colors, fillers, and the basic principles of casting and laminating. No longer is he merely cutting sheets of plastic, plywood or hardboard from stock, to be fabricated into a finished product. Now he is actually manufacturing . . . starting with raw materials, following the fabricating steps and producing his finished article! And don't underestimate the ability of your students. A lot of boys have a surprising aptitude for this work and many non-progressive students have responded quickly to the fascinating projects possible with these amazing materials.

Liquid Plastics Fit Into Every Shop Course

Because of their versatility, the use of Castolite resins and fibers is not confined to plastic courses. On the contrary, they combine beautifully with wood and/or metal, becoming either part of the finished article or being used in the process of fabricating. Project costs range from 5¢ to $1.50. A great many excellent and worthwhile novelty items can be made for an average cost of 25¢. Larger projects, such as the building of a 12 foot all-fiberglass boat, for example, are of special interest to many evening school groups.

How to Get Started

A series of specific project applications, with clear-cut directions, has been written by experienced teachers to help shop men and students alike to get started right. "Working With Liquid Castoglas in the School Shop" was written this summer . . . the result of extensive field work and practical experience in industrial arts, fine arts and vocational education. It outlines a sensible starting program which fits readily into the existing curriculum.

It will certainly be worth your while to write for this new pamphlet. We'll include a free copy of "How to Cast Tiles With Castoglas." These two folders will also be sent to anyone ordering any or all of the other 10¢ project folders. Price list and a folder describing class project kits will be included. Please write to:

School Dept. L-50

THE CASTOLITE COMPANY
Manufacturing Chemists
WOODSTOCK, ILLINOIS

YOU CAN MAKE IT WITH

Castolite

Modern Jewelry Castings

Distinctive jewelry combines rare woods with Castolite and Castoglas. Most of these projects can be made easily by junior high school students. The cloisonné pendant was made of mahagony strips and filled with Castoglas in pastel shades. Although the materials are very inexpensive and most of the pieces can be made for 20¢ to a dollar, they sell for $2.50 to $7.50 in fine specialty shops. "How to Design and Cast Modern Jewelry" tells how to make this fascinating pendant and many other attractive pieces. Price 10¢.

YOU CAN MAKE IT WITH

Castoglas

Fiberglass Chair Project

THE CASTOLITER, "How to Make Fiberglass Chairs" contains complete detailed instructions for designing and forming three types of chairs. Also shows how to make new seats for old chairs. This 8th grader is finishing a one-piece laminate which was formed over a plaster mold. A new method also illustrates the shaping of seats and backs without molds. Colors are mixed with Castoglas and permanently molded into the glass laminates. Chair projects may be made for as little as $2.25. Order your copy of this important CASTOLITER for 10¢.

New Publications

Modernizing and Repairing Upholstered Furniture

By Herbert Bast. Cloth, 73 pp., 7⅛ by 10½ in., illus., $3. The Bruce Publishing Co., 400 N. Broadway, Milwaukee 1, Wis.

Repairing furniture can be made interesting and enjoyable by following the directions given by this well-known author who has a wealth of actual experience in this field of upholstering and furniture repairing.

The book shows what tools and supplies are needed. It also explains how to make pillows, trim upholstered furniture, upholster chairs, bed frames, telephone stands, and dressing tables.

Radio and Television Bibliography

By Gertrude G. Broderick. Office of Education Bulletin 1956, No. 2 46 pp., 25 cents. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

For students of radio and television, for broadcasters, program directors, and others in the professions of radio and television — a new bibliography, *Radio and Television Bibliography*, is presented. This new bulletin, which supersedes Bulletin 1952, No. 18, of the same title, is extremely useful for an easy selection of materials from the rapidly growing mass of publications on these media. The booklet includes titles, authors, publishers, dates of publication, and short résumés of content for the following three types of publications: works of an historical, philosophical, or sociological nature; vocational training aids; and technical texts.

The bibliography is concentrated on publications of the past ten years. The only works published before the past decade, which are included, are standard texts. One hundred and fifty of the latest publications on television and radio give this bulletin a welcome currency.

This indexed booklet includes sections entitled: "Educational Uses," "Scripts and Plays," "Program Techniques," and "Technical Aspects." It also lists periodicals and other sources of information.

Radio and Television Bibliography is an easy-to-use bibliography which will be welcomed by both those who wish to bring their old references up to date and those who have no bibliography of works on radio and television.

Build It Yourself Book for Boys

Cloth, 192 pp., 6½ by 9½ in., illus., $2.50. Popular Mechanics Press, Chicago, Ill.

A book which will please practically every boy. It is excellently illustrated and the descriptive material is clear and brief.

In it are described how to make airplanes and aquaplanes, archery equipment, bird shelters, boomerangs, diving raft, electric dart board, electric motors, hunting knife, hydroplane model, kites, log cabins, microscope, paddle float, printing press, radio sets, log raft, railroad modeling, rubber-band shooter, scooter, sidewalk cars, sprinkler truck, squirt gun, model of *S.S. United States*, surfboard, taxidermy, telegraph set, telephone, three types of water craft, water skis, weather instruments, toboggans, bobsleds, skating rink, folding worktable, and wren house.

Management for Tomorrow

By the Society for Advancement of Management — Philadelphia Chapter. Cloth, 196 pp., 5⅞ by 8¾ in., illus., $6. Chilton & Co., Philadelphia, Pa.

This is a collection of presentations of the Society for Advancement of Management, Philadelphia Chapter, made at the eighth annual conference on the duties of men in management made by executives, professionals, and administrators, who have studied and worked on improving the developing of managers, incentive methods and controls, integrated data processing, productivity, and discovering the common goals of management and labor.

The aim of this organization is to develop efficiency through the scientific application of management; to promote the mutual interests of management, labor, investors, government, and the public; to promote the common interests of all of these groups; and to inspire management and the employees to adhere to a high ethical concept of their social responsibilities.

Abacs or Nomograms

By A. Giet. Translated and revised by J. W. Head and H. D. Phippen. Cloth, 225 pp., 5¾ by 8¾ in., illus., $12. Philosophical Library, New York, N. Y.

A graphical method for conveniently solving formulas involving two or more variables.

It is a translation from the French, and it will be found useful by many engineers in solving engineering problems.

Factory Electrification

By F. T. Bartho and C. H. Pike. Cloth, 308 pp., 5⅞ by 8¾ in., illus., $12. Philosophical Library, New York, N. Y.

This book, written by two electrical engineers who have had wide experience in planning the equipment required by different industries, should be very helpful to those who have to install and maintain electrical machinery or to electrify an entire plant.

(Continued on page 46A)

STRETCH FORM
BLOW FORM
VACUUM FORM
DI-ACRO PLASTICS PRESS
brings the techniques of the plastics industry into the school shop
MATERIALS AVAILABLE AT LOW COST
A variety of colors are available in 18" x 24" sheets of both acrylic and styrene plastics in many thicknesses.
PROJECTS ARE AVAILABLE, TOO
Plastics for the School Shop —twelve new plastics projects—have been published to stimulate thinking in blow, vacuum and stretch forming.
Di-Acro Plastic Press No. 18 is a three way press that will professionally execute hundreds of new plastics projects. It stretch forms pre-heated plastics over student made wood or plaster plugs. It blow and vacuum forms by motor driven pump into easy-to-fashion molds. Handles sheets up to 18" x 18".
Di-Acro Plastic Press No. 1 stretch forms only, but can easily be converted to blow forming. Other features same as No. 18.
All Di-Acro products are backed by one year warranty
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PRECISION METALWORKING MACHINES
PLEASE SEND
Plastics Press Literature
Plastics Price Sheets
Plastics for the School Shop
O'NEIL-IRWIN MFG. CO.
311 Eighth Ave. • Lake City, Minn.
Name
School
Address

WALKER-TURNER

Skills learned today on "Light-Heavyweights" will stand by your students later

New Model!

Your students will learn more from this machine — it's one they'll find later in industry . . . . . .

Walker-Turner "Light-Heavyweight" Variable Speed Lathe

Four-Speed Lathe also available

NEW working features that make your teaching more effective . . . . . .

1. Speed can be varied from 660 to 3550 rpm in smooth, stepless variation — while the machine is running.
2. Conveniently located handwheel at front of headstock controls speeds; graduated scale shows speeds at a glance.
3. Primarily a general purpose wood-turning lathe of great precision — but massive construction, double-row, preloaded spindle bearings make it perfect for metal spinning.
4. Capacity: swing over gap, 15½"; over bed, 12"; distance between centers, 38". No. 2 Morse Taper Socket in spindle nose and tailstock spindle.
5. BIG machine performance — priced well within your department's budget.

NEW safety features . . .

Variable speed mechanism eliminates belt and pulley changes. Mechanism is completely enclosed. Motor is readily accessible for adjustment. Big, convenient storage space keeps accessories and tools out of the way.

FREE new Specification Guide for schools

This new W-T guide is packed with information you'll want when planning purchases of new machines. Write for it today. We'll include W-T *free* teaching aids, catalog, and name of your nearest W-T Distributor.

walker-Turner

WALKER-TURNER

Division

Rockwell Manufacturing Co. · Pittsburgh 8, Pa.

DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT
RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS
RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS
JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

HERE ARE SOME OF THE NEW THINGS YOUR STUDENTS CAN MAKE WITH THESE AMAZING NEW PLASTICS!

For Example...PLASTIC PLANTS

They're Easy to Make — Lots of Fun, too, with VINOFLEX

the Remarkable New Liquid Vinyl Plastic that Produces Foliage so Realistic and Life-Like, its Hard to Tell it From Live, Growing Leaves when Viewed from Just a Few Feet Away!

Now — your students can make a wide variety of authentic-looking evergreen plants for decorating windows and planter boxes with the same material used to make dolls that look and feel so real. Vinoflex, newest marvel of the plastics world, is a syrup-like liquid that pours easily and forms a tough, resilient, rubbery material when exposed to oven heat from 300 to 325 deg. F. One of the unique features is that it can be used to make *internal or external* reproductions of a mold. Molds can be made of metal, glass, plaster — anything that withstands 325 degrees for a few minutes. Vinoflex foliages are Fireproof, Washable, Fade-Resistant, Droopless — can be cleansed with a damp cloth. Available in white, opaque, clear, light or dark green, red and yellow. Vinoflex comes in 8-oz., pint, quart and gallon sizes. It's ideal for making an endless variety of toys and novelties, too!

Plastic Plants (and Real Ones, too) Need a

PLASTIC GREENHOUSE!

Build Your Own with Polyethylene & Vinyl Film

We have them 0.002" and thicker. In rolls up to 6 ft. wide. Also make a perfect moisture barrier and mulch on strawberry plant beds.

Projects in

FIBERGLAS-POLYESTER AND EPOXY RESINS

Give a Lift to Any Course in Plastics!

Repair and Restyle Auto Bodies and Fenders, Build Boats, Work Bench Tops, Awnings, Furniture, etc.

Send for FREE literature giving complete buying information on *everything* you need in Fiberglas-Plastic for the school shop. It describes in detail Glass Cloth, Resins, Extenders, Catalysts, Solvents, "How-To" Books, etc. Also includes sample of this remarkable material for your inspection.

SPECIAL OFFER!

Beginner's Kit

Our "COVER-IT KIT" contains the right amount of material for the beginner student, or to experiment with yourself. Let's you see how easy it is to repair boats, toys, lamps, furniture, etc. Complete Kit.....$3.95 (plus 50c postage)

White Polyethylene Rope

It floats! Produced by the twisted-spun-laid method. It's attractive, long lasting, lightweight, dimensionally stable. Completely waterproof and buoyant. 30% lighter than natural fibre rope. Has extremely high resistance to virtually all types of acids and solvents, salt water, alcohol. It is unaffected by mold, bacteria, rot, fungi. Has excellent weathering characteristics. Does not deteriorate with age. Available in 3/16" to ¼" dia. Ideal for water ski tow lines, lane markers for swimming pools, heaving lines and other life-saving equipment, functional and decorative applications.

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St. Louis 10, Mo.

NEW PUBLICATIONS

(Continued from page 44A)

It explains clearly what the general requirements for electrical installations are and describes main distribution switchgears, power transformers, cables and wiring systems, a.c. induction and 3-phase commutator motors, d.c. motors, synchronous motors and power factor improvement, motor control gear, and motor application.

Aircraft Production Methods

By Gordon B. Ashmead. Cloth, 293 pp., 6¼ by 9¼ in., illus., $7.50. Chilton Co., Philadelphia, Pa.

A description of production methods used by successful airplane plants of the United States.

The author explains how the master plaster pattern is made, how the sheet metal is prepared and formed by various methods, how the machined parts are heat-treated. He also discusses the tooling up for production, welding, machining, and duplicating, jig and fixture making and storing, and the final inspection.

Aviation Periodicals for Teachers and Pupils

By Willis C. Brown, Specialist for Aviation Education. June, 1956. 5 pp. Free from Office of Education, Washington 25, D. C.

A list of 36 periodicals devoted to flying, aviation trade news, model-plane hobbies, engineering and general aviation interests. These selections are suitable for junior, senior, and adult readers and are intended to be of aid in understanding current developments in aviation as related to life today and in the future.

The Generation of Electricity by Wind Power

By E. W. Golding. Cloth, 318 pp., 5¾ by 8¾ in., illus., $12. Philosophical Library, New York, N. Y.

An interesting book on the history and development of wind power for various uses.

The book describes how the energy obtainable from the wind may be estimated, the wind characteristics and distribution, wind power sites, wind surveys, wind flow over hills, measurement of wind velocity, wind structure and its determination, wind data and energy-driven machines, propeller-type windmills, wind-power plants, economy of wind-power generation, construction costs, research, and development.

The appendices present a selected bibliography of surface wind data and a glossary of terms.

Allied's Electronics Data Handbook

Paper, 64 pp., 6 by 9 in., illus., 35 cents. Allied Radio Corporation, Chicago, Ill.

This is the second edition of this handy data book. It contains formulas which include those needed for basic circuit analysis, transmission line calculations, determination of vacuum-tube characteristics, resonance calculations, meter calculations, etc.

Included are up-to-date RETMA and military specifications for resistors and capacitors, coil-winding data, wire-gauge data, metric relationships, tables for directly interchangeable radio and TV picture tubes, interchangable batteries, decimal equivalents of fractions, pilot lamps, logarithms, trigonometric functions, etc. A three-page explanation on the use of logarithms precedes the logarithm tables. Additional data covers Attenuator Networks; Minimum Loss Pads; Mixers; Decibels vs. Voltage; Current and Power Ratios; and complete details on using the RETMA 80.7-volt system of speaker hookup.

Rural Water Supply and Sanitation

By Forrest B. Wright. Cloth, 347 pp., 5¾ by 8⅞ in., illus., $4.96. John Wiley & Sons, Inc., New York, N. Y.

This is the second edition of this book. It is well illustrated and presents the subject matter clearly and interestingly.

Part One, with its eleven chapters, shows the importance of water; its sources; explains water treatment; problems of head and pressure; pumps, types, and operation; water-system installations; maintenance of water systems; plumbing systems for homes and farms; sewage and garbage disposal; and other useful information.

Part Two, in its fifteen chapters, describes how to measure, ream, and thread steel pipe; making copper-tubing joints; valves; faucets; repairing faucets; repairing toilet tanks; studying plumbing installations; cutting cast-iron soil pipe; caulking a lead joint; building a septic tank; building cesspools and seepage pits; laying sewer and drain tile; and leveling to determine gravity head on water systems.

Hints to Teaching Electricity and Electronics

By S. H. Dumville. Paper, 51 pp., 5½ by 8½ in., illus., $1. Dumville Manufacturing Co., Washington, D. C.

This little booklet demonstrates basic electricity as well as electronics. To do this, the author advises the use of Model S1114 — a kit made by the Dumville Manufacturing Company — to teach the student how electricity is produced, transmitted, and transformed, and used.

The student also is taught electric resonance and radiation, vacuum-tube operation, electronic symbols, etc.

Then the same Model S1114 is used to teach electronics.

Mandl's Television Servicing

By Matthew Mandl. Cloth, 460 pp., 6¼ by 9½ in., illus., $6.50. The Macmillan Company, New York, N. Y.

This is a thoroughly revised edition. It is an excellent text for those who are studying the subject in school, besides serving as a fine reference for those who are actually working in the servicing field.

The material covers the following: television receiver fundamentals; localizing the trouble; master index to common television troubles; R-F mixer oscillator stages; the sound section; Video I-F amplifiers, detector, and D-C restorer; the Synch separator stages; the vertical sweep system; the horizontal sweep system; repairing and improving antenna system; transistors; VHF-UHF servicing factors; the oscilloscope; the sweep generator; the marker and other servicing equipment; color television servicing; and additional circuits and systems.

The appendix contains many useful tables of information besides a glossary of color television terms and definitions.

Basic Electronics, Volumes 1, 2, 3, 4, and 5

By Van Valkenburgh, Nooger, and Neville, Inc. Paper covers, total number of pages in five volumes equal. Together, 560 pp., 6 by 9 in., illus., $2 per volume; $9 for the set of five volumes. John F. Rider Publisher, Inc., New York, N. Y.

This course on basic electronics, originally prepared for the Navy, has been proved so effective in training naval personnel that it has now been released for civilian use.

A course on basic electricity also is available.

These five volumes present a complete home study course on the subject of basic electronics.

(Continued on page 48A)

Have you met the teachers' pet? BERGER all-in-one drafting kits

Berger Drafting Kits are at the "head of the class" with instructors everywhere. And with students, too. With the Berger Drafting Kit, students are fully-equipped with every tool they need . . . every day. Sessions get under way promptly without students begging the loan of a protractor, a triangle, a scale. It's today's indispensable teaching aid.

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CLEVELAND 2, OHIO

NEW PUBLICATIONS

(Continued from page 46A)

Volume 1 treats of the nature of a power supply; half-wave rectifiers (dry metal, vacuum tube, and transformer types); full-wave rectifier circuit; filter circuits; voltage regulator circuits; other power supply circuits; and diode vacuum tubes.

Volume 2. Amplifiers (triode, tetrode, and pentode, single-stage, two-stage R.C. coupled, transformer-coupled, audio power, output, and push-pull). Also microphones, earphones, and loud-speakers.

Volume 3. Video amplifiers, RF amplifiers, and oscillators.

Volume 4. Transmitters, transmission lines and antennas; C.W. transmission and amplitude modulation.

Volume 5. Receiver antennas, detectors and mixers, TRF receivers, and superheterodyne receivers.

Industrial and Manufacturing Chemistry, Part I. Organic

By Geoffrey Martin. Seventh edition revised by Edward I. Cooke. Cloth, 752 pp., 6¾ by 9$^{15}/_{16}$ in., illus., $50. Philosophical Library, Inc., New York, N. Y.

This is the seventh edition of this book. Many of the older sections of the book have been entirely rewritten, others have been omitted or thoroughly revised to bring them up to date.

The chapters discuss the oil, fat, varnish, and soap industry; sugars, starches, cellulose; fermentation; spirits and alcohols; vinegar, lactic and butyric acids; charcoal and wood distilling; turpentine and rosin; gums and resins, natural and synthetic rubbers; aliphatic chemicals, fuel gas; coal-tar industry; synthetic coloring matters; natural dyestuffs, inks; paints and pigments; textile fibers, bleaching, and waterproofing; dyeing and color printing; leather and tanning; glue, gelatine, and albumen; synthetic and other drugs; plastics; photographic chemicals; and the tobacco industry.

Industrial and Manufacturing Chemistry, Part II, Vol. 1. Inorganic

By Geoffrey Martin, revised by Wilfrid Francis. Cloth, 600 pp., 6¾ by 9$^{15}/_{16}$ in., illus. Philosophical Library, Inc., New York, N. Y.

This is the sixth edition. The revision was made by Wilfrid Francis. The material has been brought up to date, and new material has been added wherever necessary.

The chapters discuss wood and peat, coal and processed solid fuels, liquid and gaseous fuels, producer-gas and water-gas, carbon dioxide, industrial ozone, technology of waters, natural sulphurs, sulphuric acid, sulphur dioxide and sulphites, other sulphur compounds, salt, hydrochloric acid, sodium sulphate, sodium carbonate and caustic soda, sodium carbonate, potassium salts, calcium and magnesium salts, gypsum, barium salts, strontium salts, compounds of boron, chlorine, electrolytic chlorine and alkali, liquid chlorine, chlorates and perchlorates, bleaching powder and hypochlorites, bromine, iodine, hydrofluoric acid, peroxides and peracids, nitrogen and nitrates, nitric acid and nitrous oxide, ammonia and ammonium salts, synthetic ammonia, cyanamides, cyanide and prussiates, refrigerating and ice-making, liquefaction of gases, oxygen, nitrogen, pyrometry and pyroscopy, principles of combustion, and combustion appliances.

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SOLDER

Business and Personal News

NEW VICE-PRESIDENT AT YATES-AMERICAN

C. K. Olson, Jr., has been elected vice-president and director of sales of all products manufactured by the Yates-American Machine Company at Beloit, Wis.

For the past two years Mr. Olson has been co-ordinator of sales for the Head & Knife and Lipman Refrigeration Divisions as well as the J-Line, Power Tool, and Heavy Woodworking Divisions. In addition to his present duties he will now direct the sales program of the Heat Transfer Products Division. His added responsibility includes sales direction of a new line of heat exchangers recently introduced by Yates-American.

DONALD SAUNTER PROMOTED

Dodge Manufacturing Corporation announces the promotion of Donald Saunter to the position of director of production and purchasing. Mr. Saunter is a native of South Bend, Ind. He joined the Dodge organization in 1937.

F. WELDON MUNSON RECEIVES APPOINTMENT

Dreis & Krump Mfg. Company has appointed F. Weldon Munson director of industrial relations, according to A. J. DeWolf, president.

For the five years previous Mr. Munson was with G. Felsenthal & Sons, Inc., in a similar capacity. He is a member of the Illinois Bar Association.

NEW DISTRICT SALES MANAGER

William F. Styer has been named Milwaukee district sales manager for DeWalt, Inc., manufacturer of woodworking equipment for industrial and homeshop uses. Mr. Styer's territory includes that portion of the state of Wisconsin from Oshkosh south to the north of Peoria, Ill., excluding the immediate Chicago metropolitan area.

Mr. Styer joined DeWalt, Inc., a subsidiary of American Machine & Foundry Company, in March, 1955, as a demonstrator-salesman. In this capacity, he traveled widely throughout the United States and Canada assisting the company's district managers and retail dealers in their selling and promotion efforts.

Descriptive Material

GRAMERCY IMPORT COMPANY CATALOG

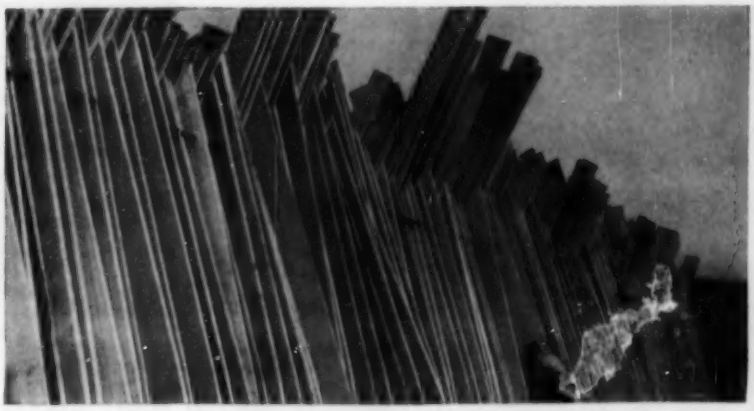
"Operation Craftsmanship II" is the second edition of the story of custom-finished quality imported drawing instruments from the Gramercy Guild Group. The first section tells the story of Riefler custom-finished quality imported instruments, and distributed in the United States by the Gramercy Import Company, Inc.

Here is the story of the Gramercy Guild Group and especially the story of Riefler and the complete "G-series" of instruments and sets. Included here are the favorite centerscrew, ringhead, and quick-action instruments in numerous combinations and sets. New sets can be made up according to specific requests.

(Continued on page 50A)

CORISA

THE QUALITY LUMBER THAT STAYS STRAIGHT!



CORISA . . . tried . . . proved . . . accepted!

CORISA . . . attractive . . . economical . . . free of defects!

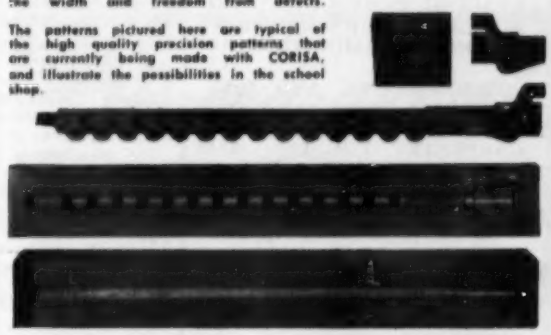
CORISA . . . an ideal lumber for use in vocational and other school classes in manual training, woodworking and patternmaking.

CORISA offers the following advantages:

- 1. Carves readily, both with and against the grain.
- 2. Is dimensionally stable even in thin-shelled sections.
- 3. Costs less than other lumbers of comparable grade.
- 4. Offers more usable lumber per dollar.
- 5. Takes coatings well.
- 6. Is cut thick — in most cases an 8/4 board will produce a 2" planed board.
- 7. Is kiln-dried to proper moisture content.
- 8. Has excellent grain structure.
- 9. Contains a high percentage of quarter sawn stock.
- 10. Is available in a variety of grades to suit practically any type work and purse, from one board to a carload, in thicknesses of 4/4, 5/4, 6/4, 8/4, 10/4 and 12/4. Firsts and seconds and selected grade is practically free of defects.

The above photo shows typical CORISA boards during the curing process. Note the width and freedom from defects.

The patterns pictured here are typical of the high quality precision patterns that are currently being made with CORISA, and illustrate the possibilities in the school shop.



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NEW LOW PRICES! Model 1400CT. Table Model $1195
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NO. 706 FURNACE

Helps you teach a variety of heat treating techniques —hardening, tempering and annealing steels.

Six No. 5, Type A Bunsen Burners give this versatile furnace a 400° to 1800° F. range. Temperatures easily controlled. Ratchet-operated door opens upwards. Use with natural, artificial, mixed or bottled gas. Economical and efficient with all. Firebox 7" by 13" by 16½". 78,000 BTU's per hr. (natural gas).

NO. 706 PEDESTAL $312.00
BENCH MODEL ..$287.00

NO. 454 — smaller version, 4 burners, 5" by 7½" by 13½" firebox —
PEDESTAL $174.00
BENCH MODEL ...$149.00
(All prices F.O.B. Factory)

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10. RADIO-TELEVISION AND BASIC ELECTRONICS $4.95

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DESCRIPTIVE MATERIAL

(Continued from page 48A)

The second section introduces the Gramercy Guild Group—a diversified selection of many types of quality imported drawing instruments, manufactured for Gramercy Import Company by various German craftsmen and distributed under the Gramercy Guild Group crest of quality.

In order to improve constantly, and to maintain the highest standards of quality and design in the drawing instrument field, an Appendix to the catalog "Operation Craftsmanship II" is also available. Copies of the catalog and appendix are obtainable upon request.

(For Convenience Circle Index Code 0816)

BLACKHAWK CATALOG P-51

Blackhawk Manufacturing Company has issued Catalog P-51, which supersedes Catalogs P-50 and P-50A and Shop Manual P-249; and Catalogs J-101, J-101C; and Blackhawk U. S. Suggested *User* Price List for all Porto-Power Equipment.

Catalog P-51 describes their line of Porto-Power tools; bench-rack; Bantam Porto-Power rams, pumps, attachments, assortments; the 10-ton line of Porto-Power Pumps, rams, and attachments; Heavy-Duty Porto-Power equipment; Reck-Rack presses; Hydraulic presses; electrically-driven pumps; Spee-D-Coupler, hoses, gauges, and fittings; and Porto-Power maintenance and electrical sets.

Copies available upon request.

(For Convenience Circle Index Code 0817)

WOODWORKING PROJECT BOOKS

Rogers Isinglass & Glue Company, manufacturers of liquid fish glue used for repairing broken articles and furniture of all kinds, are offering a project plan book for Do-It-Yourself Projects to the home workshop owner. The book contains 25 of the most popular woodworking projects prepared and produced by Rogers Isinglass & Glue Company over the past ten years.

Each woodworking plan is thoroughly blueprinted on a self-contained sheet for quick, simple consultation. Instructions and necessary diagrams are included. The list of the project plans indicates the scope and variety of interesting items that can be built right at home.

Also available is The Rogers Book of Woodworking Shop Notes, which gives pertinent information on how to plan and develop your new woodcraft hobby.

For a free woodworking booklet and for further details on the project plan manual, write to the company.

(For Convenience Circle Index Code 0818)

AMERICAN GAS FURNACE CO. CATALOG

The American Gas Furnace Company have made available their catalog which covers very completely their line of controlled atmosphere reciprocating hearth furnaces, and continuous automatic quenching tanks. All of the outstanding features of their models are clearly described and illustrated in this catalog.

A copy is available upon request.

(For Convenience Circle Index Code 0819)

COLOR FILM ON OPTICAL TOOLING

A new color film entitled "Optical Tooling," is available from the Charles Bruning Company, exclusive distributors of Brunson instruments.

The film, 16mm., optical sound track, running time, 35 min., is available on free loan to industrial firms, engineering associations, and educational institutions. It was released in April, 1956.

Optical tooling, the revolutionary new method of measuring, positioning, and aligning, is presented in a simple, concise manner by means of animated drawings and working models of optical instruments and tooling bars. The film covers the principles of optical tooling, illustrates some of its general applications, and shows its advantages over older mechanical methods. The film also illustrates specific industrial applications in research, design, and production.

Requests for this film should be addressed to the Sales Planning Department, Charles Bruning Company.

(For Convenience Circle Index Code 0820)

ELECTRICAL EQUIPMENT BOOKLET AND TRAINING CHART SET

Delco-Remy announces the 1956 edition of the booklet "12-Volt Electrical Equipment for Passenger Cars," and the 12-Volt Training Chart set.

The booklet contains a description of Delco-Remy 12-volt automotive electrical equipment used on 1956 model passenger cars, and gives recommendations for periodic servicing, checking, and adjusting of the charging, starting, and ignition systems. It contains 24 pages and 48 illustrations. Free in limited quantities.

The 12-Volt Chart Set consists of 17 charts 26 by 36 in. in size bound into a set. Charts are enlarged pictures of various illustrations and wiring diagrams found in the 12-volt booklet.

For complete information write to Delco-Remy Company.

(For Convenience Circle Index Code 0821)

HOME STUDY LIGHTING BOOKLET

Better Light Better Sight Bureau has announced a new 8-page, two-color booklet on lighting for home study entitled "How To Make Homework Lighter." It is attractively printed and illustrated and is a completely new version of a popular and widely used Bureau booklet previously published under the same title.

The copy and drawings in the booklet are informal and are designed to appeal both to parents and to school-age children. Many of the common faults in the selection and placement of lamps are pointed out, with useful, practical suggestions on how the lighting may be improved without the necessity of extensive room changes.

Single copies of the new booklet are available without charge from Better Light Better Better Sight Bureau. Educators and vision care specialists desiring to obtain the booklet in quantity are advised to consult their local electric service company.

(For Convenience Circle Index Code 0822)

FREE WELDING MANUAL

A 40-page, basic instruction manual covering oxyacetylene welding, cutting, and lead-burning, is now being offered free to all vocational instructors of welding and metalworking to establish higher standards of safety craftsmanship in this field.

The Manual, MECO Service Bulletin No. 1, is one of the basic texts in the welding industry and was widely distributed by the U. S. Government to its various service branches during and after World War II.

Instructors in high schools, vocational schools, and colleges may obtain a free copy by addressing requests to Modern Engineering Company.

(For Convenience Circle Index Code 0823)

BERGEN COMPANY BROCHURE

Bergen Arts & Crafts Company have issued a complete illustrated brochure, which introduces the newest in jewelry-making ideas. Among the items described are the framed settings in ten different basic styles, with a unique "snap-in" feature; pressmolds

(Continued on page 53A)

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UNIVERSAL BENCH BRAKE for school shops

A quality tool accurate and easy to operate. Versatility makes it ideal for training. Popular in commercial sheet metal shops for light production, box and pan work. Replaceable bronze bushings provide long machine life. Available in 3 and 4 ft. models, universal or plain. Write for Bulletin U 3221.

Rated Capacity: 1/8 flange on 22 gage mild steel, full brake length. Fingers of case hardened steel in widths of 2, 3 and 4 inches permit 3 inch box and pan depth. Other Prices of the Bench Series

4 ft. Universal,	$220.00
3 ft. Plain,	114.50
4 ft. Plain,	134.50

All prices F.O.B. Old Saybrook, Conn.

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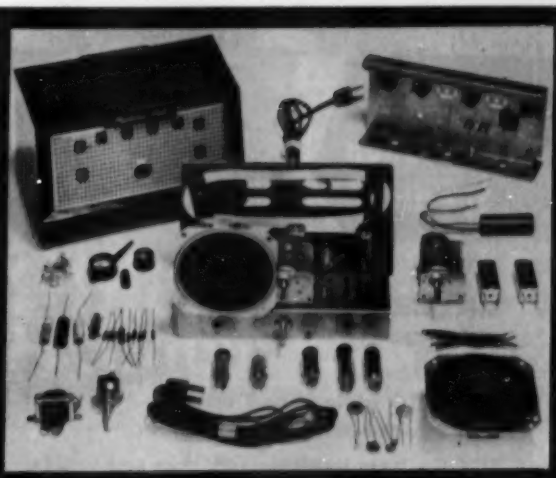


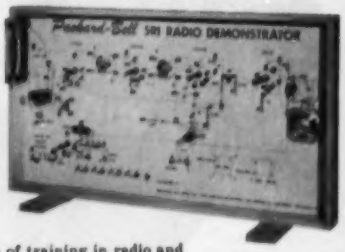
New Packard-Bell RADIO KIT

It's the famed Packard-Bell 5R1 in an exciting new kit. Perfect for student instruction in electronics. Powerful 5-tube superheterodyne circuit. Everything included... tubes wiring diagrams... beautiful black vinyl cabinet... complete parts layout... carefully prepared instruction sheets. Shipping weight 5 pounds. 6⅛" x 9¼" x 5"

$11.95*

5R1 Radio Demonstrator

25" x 46"



For use at all levels of training in radio and electronics. Schematic diagram is lithographed on ⅛" tempered masonite. 1" x 4" pine frame is painted gunmetal finish. Board comes assembled with schematic mounted, frame screwed together and painted, and all necessary holes drilled. Complete Packard-Bell radio parts kit, hardware, instructions, and illustrations necessary for the completion and operation of unit are included. Shipping weight 10 pounds. **$34.95***

ACCESSORIES FOR 5R1 RADIO

5R1—Intercom-Remote Speaker Kit. 4" p.m. speaker, transformer, 2 switches, case, wire, hardware, instructions. **$4.95***

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ELECTRONIC KITS SUPPLY CO.
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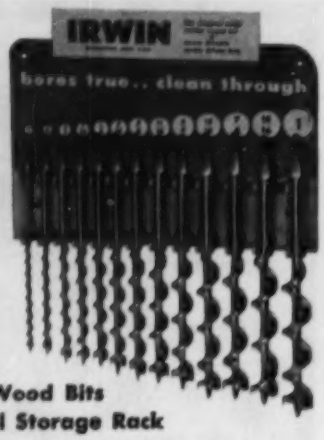
Los Angeles 26, Calif.

**F.O.B. Los Angeles, add 4% sales tax in California.*

IRWIN School Shop Special



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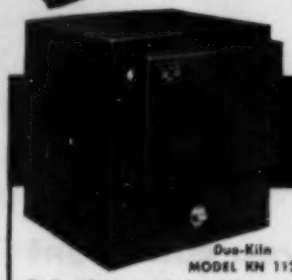

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DESCRIPTIVE MATERIAL

(Continued from page 50A)

of bisque; their easy-to-use electro-plating kit; fine silver shapes for enameling; a complete solder kit; and many other good quality items for the craftsman.

A free copy of this brochure is available upon request.

(For Convenience Circle Index Code 0824)

PLASTICAST COMPANY CATALOG

The Plasticast Company has issued their new catalog, No. 19, which is a complete guide book in the field of plastics. It describes their Plasticast Outfits, Sampler Kits, and the Plasticast Mold Maker Outfit, in addition to their fully illustrated books on casting, and a list of professional books which enable the beginner to increase his knowledge of how to work with plastics.

There is complete information about the special jewelry-making gem-craft outfit, jewelry settings, embedding materials, dyes for beautifying plastic articles, ready-made molds for casting jewelry and gift items, and many other attractive items like Plastidur, Ebonite, Iborite, Porcelite, Liquid Marble, and information on how to make artificial flowers, ceramics, statues, and puppets.

For further information write to the Plasticast Company.

(For Convenience Circle Index Code 0825)

NEW FILM AND FILM BOOKLET

Delco-Remy Division of General Motors Corporation have issued their latest film booklet called "An Introduction to the Automotive Electrical System." To accompany this booklet is an 18-minute, sound-slide, colored film. Both are basically fundamental and nontechnical and are intended for individuals who wish to become acquainted with the electrical units that make up the electrical system of the modern automobile.

The book and film are particularly suitable for driver training classes, civic organizations, elementary automotive mechanics classes, or as an introduction to instruction on electrical units. The film may be purchased or obtained on a loan basis and returned after the showing, whereas the booklet is free upon request in limited quantities.

The Delco-Remy Company have also made available their "Educational Program Booklet," which explains the literature and charts available for classroom use. In addition, they have a booklet explaining the latest 12-volt electrical equipment used on passenger cars. To accompany this is a set of charts (26 in. by 36 in. in size) showing an enlarged view of many of the illustrations in the book. Available also is a 35mm. colored strip film containing the same illustrations as the chart plus illustrations of other 12-volt units.

For further information write to the company.

(For Convenience Circle Index Code 0826)

NEW PLASTICS BOOKLET

A new booklet, containing many ideas on ways to use plastics in home building, has just been published by Bakelite Company, a Division of Union Carbide and Carbon Corporation. It is entitled "Plastics in the Home Building Industry," and is divided into sections that are easy for the builder to follow.

Illustrated in color, it tells the story of this newest group of building materials that assure the builder of installation economies, lifetime performance, and a high degree of buyer appeal.

The Bakelite Company has collected in this one booklet dozens of ideas with sketches showing the plastics materials in use. The centerfold drawing alone shows 27 established uses of plastics building materials in a cut-away sketch of an attractive modern home.

The booklet, No. 9101, is available, free on request, from Bakelite Company.

(For Convenience Circle Index Code 0827)

NEW HEINRICH CATALOG

The new catalog just issued by Heinrich Tools, Inc., is much more than a descriptive listing of their broad line of precision holding devices for rapid fire production. An outstanding feature of the 24-page book is the frequent reference to typical problems confronting tool engineers and how these problems may be solved economically by use of Heinrich tools.

The catalog describes the complete Heinrich line, including "Grip-Master" Circle-Grip holding devices; band saw and safety drill press vises, and fixture locks; air-operated machine vises, self-centering vises, air clamps and air accessories; camlock vise, screw-type drill press vise, and "Handnib" shears, nibblers, punchers, and rod cutters.

Copies of the catalog are available upon request.

(For Convenience Circle Index Code 0828)

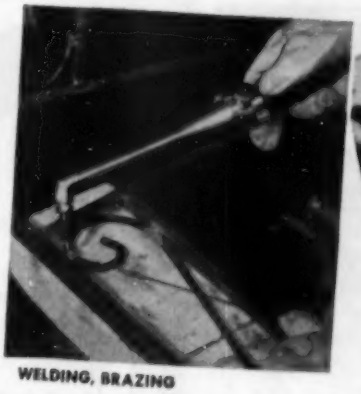
NEW KNIGHT MUSIC DISTRIBUTION SYSTEM

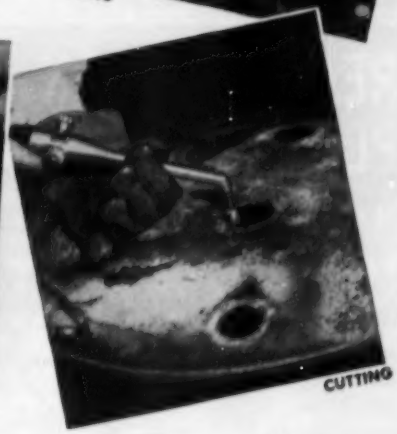
Allied Radio Corporation announces the release of a new high-fidelity, 24-watt, music distribution and public-address system. Featuring the Knight Deluxe 24-Watt High-Fidelity Amplifier, and complete with microphone, record changer and two 12-in. speakers. This new system is ideal for making voice announcements and hi-fi music distribution in restaurants, lounges, factories, offices, waiting rooms, etc.

The Knight 24-watt hi-fi amplifier, serving as the *heart* of this system, sets a new standard of tonal quality for public-address equipment. Designed to reproduce from the lowest

(Continued on next page)

Now... TEACH ALL GAS PROCESSES WITH ONE BLOWPIPE in the PREST-O-LITE Trade-Mark No. 420 OUTFIT





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(New free booklet, "LINDE Aids to Oxy-Acetylene Welding and Cutting Instruction," describes slide and motion picture films that make teaching easier, learning more complete. Your copy is ready now. Just ask for F-50142.)

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DESCRIPTIVE MATERIAL

(Continued from previous page)

bass to the highest treble overtones, this amplifier has frequency response from 20 to 40,000 cps. at full 24 watts output. Included among its features is a loudness control which boosts the low tones when volume is turned down.

Announcements can be made with the Shure Model 520-SL "Dispatcher" reluctance-type microphone, equipped with desk stand. Like the phono cartridge, the microphone is unaffected by heat and humidity.

Two General Electric S-1201-A 12-in. speakers are used in this system. Each is mounted in an Argos bass reflex corner enclosure to assure wide sound coverage and rich, vibrant tone. Speaker enclosures are available in either brown or blonde finish.

(For Convenience Circle Index Code 0829)

LOGAN ENGINEERING COMPANY CATALOG

Logan Engineering Company has released the new Lathe-Shaper Accessories Catalog, which describes sixty-six models of screw cutting and turret lathes of advanced design, including cabinet models, pedestal base models, and floor and bench models. The lathes range in size from the 14-in. swing No. 6560 through a complete line of 12-in. and 11-in. swing lathes with 1-in. collet capacity and 1⅝-in. spindle bore, and an enlarged group of 10- and 9-in. swing lathes with ½-in. collet capacity.

The catalog also gives full specifications and details on the line of Logan 8-in. Shapers. An 8-page Accessory Section lists, illustrates, and describes the attachments and accessory equipment which increase the versatility of both lathes and shapers.

Catalog is available to all machinery operators without charge.

(For Convenience Circle Index Code 0830)

PLASTIC PARTS & SALES CATALOG

The Plastic Parts & Sales Company have made available their complete price list covering the needs of the craftsman in the field of plastics. It contains listings of their line of Plexiglas sheets, colored, clear, and transparent; cellulose acetate; vinyl; laminates for engraving; Mayon tubing; clear acrylic polished rod; clear tubing; nylon rod; polyethylene sheet, rod, and tubing; polystyrene sheet, rod, and tubing; plastic film and sheeting in continuous rolls; and extensive lists of their cements, solvents, and coatings, as well as other supplies for the hobbyist.

Write for your free copy of the price list.

(For Convenience Circle Index Code 0831)

SKIL BUILDERS TOOL LINE CATALOG

Skil Corporation's colorful new 1956 catalog of the Builders Tool Line, is more than a routine listing of tools available from the company.

The catalog gives the sales story on Skil saws, drills, belt and orbital sanders, polishers, chain saws and trimmers, with emphasis also on saw blades; a saw table which converts the portable saw into a bench saw, sander, and shaper; drill kits and accessories, and power chests.

There are other new items listed for the first time in the 1956 catalog.

A copy of the catalog is available upon request.

(For Convenience Circle Index Code 0832)

WIREMOLD COMPANY ISSUES CIRCULAR

A new 8-page circular entitled "2200 3-in-1 Plugmold Electrified Baseboard" tells the complete story of The Wiremold Company's big new idea in wiring and rewiring.

Prepared for all Wiremold users it illustrates and describes the advantages of 2200 Plugmold from the point of view of architects, builders, electrical contractors, etc., and shows its wide application in residential, commercial, and industrial buildings where multiple electrical outlets and additional circuits are needed.

A full listing of the fittings and Snapicoil makes it easy for 2200 to be ordered right from the circular, while a series of sketches shows how easily it can be installed by the electrician.

For a free copy of Form 590 write to The Wiremold Company.

(For Convenience Circle Index Code 0833)

NEW DUST CONTROL BULLETIN

A new product bulletin that describes different designs of exhaust hoods for dust control in the woodworking industry has been released by the American Air Filter Company, Inc.

Bulletin 270-E3 shows how more effective exhaust hoods have been designed for the many operations common to the woodworking industry. It is the third manual to be compiled from a series of articles entitled "Scrapbook of Exhausting Ventilation," written by John M. Kane, manager of Dust Control Products, American Air Filter.

This 12-page bulletin explains the different localized applications in exhaust hooding, and many other pertinent data is made available. It is available without charge upon request.

(For Convenience Circle Index Code 0834)

REAL BUYS ON PLEXIGLAS

FOR SCHOOL SHOP PROJECTS

COLORED ASSORTMENTS

Translucent, opaque and transparent reds, blues, greens, greys, whites and others.

FOR THESE LOW PRICES!

10 LBS. . . . $9.50

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SPECIALISTS IN ELECTRONIC SUPPLY FOR SCHOOLS

Our 36th year

Now—from EVANS

A NEW TWO-WAY TOOL

It's a **Chalk Line**
It's a true **Plumb Line**
It's a real Professional Tool...
Priced Right
For You!

50 ft. - $1.49
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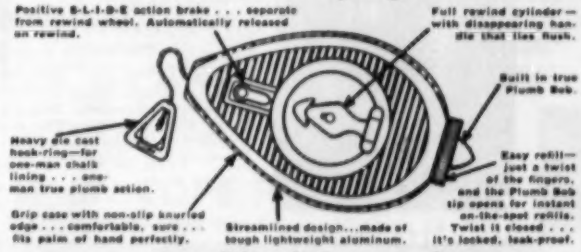
First time ever — this real mechanic's tool, at a low, low price! Engineered and Designed for Accuracy. It's Easy to Handle, Built for Long, Dependable Service!

Here's what you get:


Positive S-L-I-D-E action brake . . . separate from rewind wheel. Automatically released on rewind.
Full rewind cylinder — with disappearing handle that lies flush.
Built in true Plumb Bob.
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Easy refill—just a twist of the fingers, and the Plumb Bob tip opens for instant on-the-spot refills. Twist it closed . . . it's locked, leak-proof.
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Streamlined design...made of tough lightweight aluminum.

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Anyone can create these beautiful projects without experience

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Send new WOODWORKER'S HANDBOOK — FREE (enclose 25c if student)

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- Newest project ideas
- Embossed mouldings, carved ornaments, matched plywoods and veneers
- New! Complete lines of upholstering and archery supplies
- Same day shipment; guaranteed

Shop Equipment News

MAGNA 11-IN. BANDSAW

The Magna Power Tool Corporation, manufacturer of Shopsmith, announces a new 11-in. bandsaw for the home craftsman and industrial woodworking shop. The 11-in. bandsaw is the newest addition to the Magna line of single-purpose tools, which now includes a 6-in. belt sander, 4-in. jointer, 18-in. jigsaw, and a paint sprayer.

Magna 11-in. Bandsaw

The new Magna 11-in. bandsaw incorporates many new design, safety, and operational features introduced for the first time on any bandsaw. They include: automatic blade tracking; single-knob blade guide control; table cross slots; and high-impact polystyrene cover. The new 11-in. bandsaw, like all other Magna-line tools, can also be used as an accessory for Shopsmith, mounting in Power-Mount to utilize Shopsmith's ¾ h.p. motor and infinitely variable speeds. This new bandsaw can also be used on single or double Magna Power-Stands or an owner's homemade wood or metal stand.

More complete details may be obtained upon request.

(For Convenience Circle Index Code 0801)

PACKARD-BELL 5R1 RADIO DEMONSTRATOR

Electronics Kits Supply Company are suppliers of the new Packard-Bell 5R1 Radio Demonstrator, which is ideal for teachers and instructors of trade schools and school shops. It simplifies the task of the teacher by making dramatic presentations possible, and it leads to more rapid understanding of theory and practice of radio by students.

The construction is neat and sturdy in appearance. The schematic diagram is lithographed on tagboard stock and mounted on ⅛-in. tempered masonite. The frame is of 1 by 4-in. pine painted a gun-metal finish. Over-all size is 24 by 45 in. Adjustable legs are provided so that the unit can be used in either upright or flat position. They may be stacked for convenience one next to the other without possibility of damage to component parts. The board comes assembled with the schematic mounted, frame screwed together and painted, and all necessary holes drilled. Complete Packard-Bell radio parts kits, hardware, instructions, and illustrations necessary for the completion of the unit are included.

Further information may be obtained upon request.

(For Convenience Circle Index Code 0802)

Packard-Bell 5R1 Radio Demonstrator

NEW OUTSIDE MICROMETER

The Lufkin Rule Company have introduced a new hole locating and tubing micrometer, which has an extra small diameter (.089-in.) anvil, small enough to enter a $\frac{5}{32}$-in. i.d. hole or slot. The anvil is held with a setscrew and can be easily and quickly replaced in case of wear or breakage.

New Outside Micrometer

The micrometer has a nonglaring chrome clad finish on the thimble and hub, and has a black enameled, heavy duty ribbed, half frame. It has a range of 0 to 1 in. by 1000ths, and is furnished with either a plain thimble or with a ratchet cap.

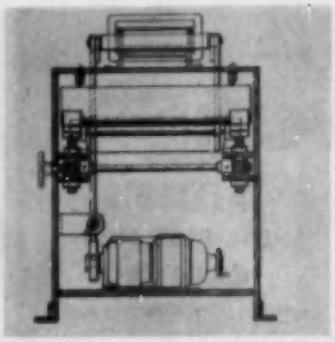
Write to The Lufkin Rule Company for more detailed information.

(For Convenience Circle Index Code 0803)

NEW HEAT TREATING FURNACE

Philip C. Osterman, president of American Gas Furnace Company, has recently received U. S. Patent No. 2,726,854 upon equipment that accomplishes the heat treating of products ranging from ordinary pins and safety pins up to large machine parts that affect us substantially in our daily lives.

In describing his invention for the patent office, Mr. Osterman has explained as follows: "The present invention relates generally to heat treating furnaces and apparatus useful in the treating of relatively small workpieces and is concerned more particularly with improvements in the means for conveying the work step-by-step from a loading station outside the furnace through the heating chamber of the furnace where the treating process is carried out. A primary aim of the invention is to distribute the work evenly over the furnace hearth and at the same time progressively move the work in an agitative manner through the heat treating zone so that each piece is subjected to a uniform treatment."



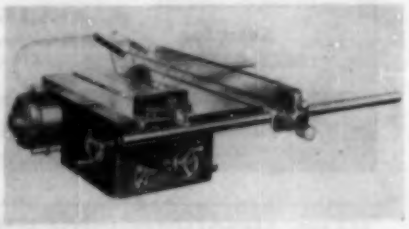
New Heat Treating Furnace

Further information available upon request.

(For Convenience Circle Index Code 0804)

BOICE-CRANE TABLE SAW

A new 10-in. table saw with improved floating-pulley drive has just been announced by the Boice-Crane Company.



New 10-inch Table Saw with floating pulley drive

The new power drive makes the motor an integral part of the unit, but the unique rolling-type of floating pulley makes tilting the motor unnecessary. Belt tensioning is automatic. Another feature of the new drive permits powering for heavy work by motors up to 1½ h.p.

Many other new features are included in the new table saw, and a brochure covering these items is available from the above named firm.

(For Convenience Circle Index Code 0805)

NEW "PET" OSCILLATING SANDER

The new improved PET Oscillating Sander for industrial or home workshop use is an all-ball-bearing sander. It has a heavy-duty shaded pole, induction-type, 115-vole a.c. motor. Takes heavy continuous sanding loads easily. It has no commutator or brushes

(Continued on page 58A)

New "PET" Oscillating Sander

SEALS THEM ALL – PERMANENTLY

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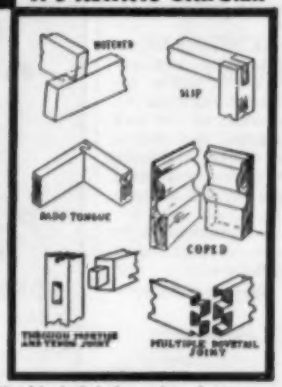
IT'S CLEARER
IT'S STRONGER
IT'S ALWAYS UNIFORM

3,895 LBS.
ACTUAL SHEARING STRENGTH
PER SQUARE INCH



NO MATTER WHAT THE JOINT IT'S BOUND FIRM WITH ROGERS . . . and Rogers will Never Discolor Wood Materials. The joints shown here are only 6 of the 24 Typical Joints shown in Rogers Book of Woodworking Notes which you can have FREE.

It's full of helpful data, handy as a teaching aid. Send for Your Copy and Rogers Free Project Plans, TODAY!

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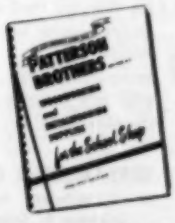
Catalog of WOODWORKING & METALWORKING MACHINERY, TOOLS AND EQUIPMENT

The new 1956 Patterson Brothers catalog, listing all the latest in: Metals, Benches, Electrical supplies, Finishing materials, Hand tools, Hardware, Machine tools, Metalworking tools, Portable Electric tools, Precision tools, Sheet metal equipment, Welding Equipment. Contains up-to-the-minute information on equipment needed for the complete school shop.



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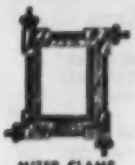
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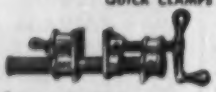

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SHOP EQUIPMENT NEWS

(Continued from page 56A)

to wear out. The orbital motion of this sander is 3/16 in. in diameter and operates at 3450 orbits per minute.

The PET "200" features an indented finger-grip handle and an adjustable auxiliary handle, which provides a secure means for handling the sander in awkward positions. An unobstructed view of the front of the pad is obtained for "feather edging" and corner sanding. A dual set of air intakes maintains a cool, even temperature under continuous sanding operations. The housing has a handsome mirror finish.

This oscillating sander is manufactured by Portable Electric Tools, Inc. Further information is available upon request.

(For Convenience Circle Index Code 0806)

TUBULAR HANDLE HAMMERS

Estwing Manufacturing Company has introduced a line of new Tubular Handle Hammers as an additional item to their famous line of Unbreakable Hammers and other hand tools. The solid steel head of the Estwing Tubular is *fused* into the high alloy steel tube to give double strength at the point of greatest strain. The tube is oval shaped through its entire length to assure maximum strength.

Tubular Handle Hammer

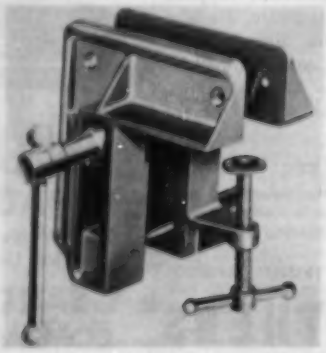
The specially developed *cushion* grip cannot be affected by sweat, gasoline, or oil in normal use. The grip is permanently bonded to the handle by a special process, and cannot stretch or loosen. The entire tool is guaranteed unbreakable under all normal conditions.

Complete details are available upon request.

(For Convenience Circle Index Code 0807)

ALUMINUM CARPENTER'S VISE

The Columbian Vise & Mfg. Company has announced a new aluminum carpenter's vise, which is ideal for home workshops. Known as No. 1655, it has 5 by 5-in. aluminum alloy jaws. These open 3½ in. to



Columbian Carpenter's Vise No. 1655

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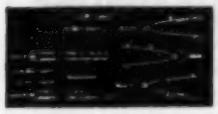

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(For Convenience Circle Index Code 0808)

FOUR-STUDENT BENCH TOP

The Tolerton Company, manufacturers of Tolco Vocational Education Equipment, have redesigned their four-student bench tops. The new angular steel splined tops will be available on all four student benches in the popular 2½ by 54 by 64-in. size. Tops of this size have been constructed with either 5- or 5½-in. laminated end battens fastened in various ways across the end of the bench. The purpose of the battens was to keep the work surface flat.

Tolco Model TM-12A with steel splined top.
Inset shows an end view of the heavy angular steel spline inserted in the end grain

The new Tolco steel splined top eliminates the battens that have been a source of trouble on such large tops. The method used to insert the spline still furnishes a 100 per cent laminated hard maple work surface over the entire top area. The heavy steel spline will prevent bowing.

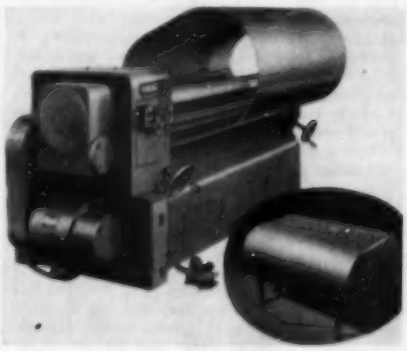
Further information may be obtained by writing to the manufacturer named above.

(For Convenience Circle Index Code 0809)

NEW NIAGARA SLIP ROLL FORMERS

Niagara Slip Roll Forming Machines are now built in modified models for rapid forming of obround and rectangular shapes. Both power and hand operated machines can now be equipped with this new feature.

(Continued on next page)



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Model	Interior Size	Watts 115 V	Price F.O.B. Phila.
7033	12"x11"x5"	12 Amps	$85.00

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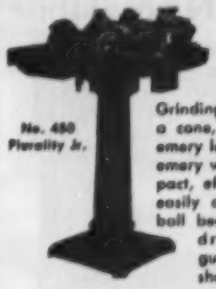

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SHOP EQUIPMENT NEWS

(Continued from previous page)

With this optional equipment, Niagara Slip Roll Formers alternately produce curved and flat surfaces for high production of obround tanks and containers, round cornered rectangular pipe sections and similar objects.

On the 6-in. diameter machine, the rear roll is positioned pneumatically between two limits to alternately form curves and flats. On smaller diameter machines, the rear roll action is mechanical.

Only a simple layout on the sheet, with markings where curves begin and end, is all that is required as a guide. Flat surfaces are *feathered* into curves by the continuous rotation of the rolls during radius changes.

Literature covering this new modification, as well as the complete line of Niagara Slip Roll Forming Machines, can be obtained by requesting new Bulletin 77 from Niagara Machine and Tool Works.

(For Convenience Circle Index Code 0810)

NEW TABLE-TOP REPRODUCTION MACHINE

A new table-top diazo reproduction machine designed to provide reproduction facilities for schools and for small engineering and architectural firms or departments, has been introduced by the Charles Bruning Company, Inc.

Bruning Copyflex Model 300

The new machine, known as the Model 300, includes the following features: 30-in. printing width, top mechanical speed of 8 ft. 6 in. per minute, variable speed drive with 100,000-hour-life-rated selenium rectifiers, 1200-watt quartz lamp with 34-in. active length, and a 12 by 30-in. rear delivery tray. The machine operates on a 115 volt, 60 cycle, 17.2 ampere alternating current.

The machine is a completely self-contained unit needing only an electrical connection for operation. It does not require any vents, darkroom facilities, or auxiliary equipment, so it can be located and used almost anywhere. It is also simple to operate. Exposure and development are automatically synchronized; a single control knob turns the machine on or off and regulates its speed.

The machine is 15 in. high, 45¾ in. wide, and 31 in. deep (including rear delivery tray).

(For Convenience Circle Index Code 0811)

SOLDERLESS TERMINAL KIT NO. 395

Vaco Products Company have brought out a sensational solderless terminal kit specially designed for use by hobbyists, model railroad enthusiasts, amateur radio and TV set builders and operators, home workshop, and hi-fi

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More complete information may be obtained from the above mentioned firm.

(For Convenience Circle Index Code 0812)

OSCILLATING SPINDLE SANDER-GRINDER

Boice-Crane Company has recently announced their new, improved model oscillating spindle sander-grinder, the first to utilize abrasives on work spindles under 3/4-in. diameter. It is provided with spindles 1/4 in., 3/8 in., 1/2 in., and 3/4 in. in diameter.

Oscillating Spindle Sander Grinder

With the new smaller diameters any kind of scroll-grill work or small radius contours can be machine finished many times faster and better than by hand.

(For Convenience Circle Index Code 0813)

NEW AIRCO HELIWELD HEAD

Air Reduction Sales Company, a division of Air Reduction Company, Inc., have announced a new Model C Heliweld Automatic Head, which provides a completely automatic weld cycle. A single switch causes the holder to move downward and start the arc, and the arc length is maintained constant throughout the weld. Heliwelding is Air Reduction's tungsten inert-gas arc welding process for joining light gauges of stainless steel, mild steel, aluminum, brass, copper, titanium, beryllium, Everdur, Nickel, Inconel and Monel.

Electronically controlled this new Airco Heliweld unit is primarily designed for DC Heliwelding with Argon or Helium shielding gases, or a mixture of the two. It can also be used for AC Heliwelding with the Airco Heliwelders or the Airco Heliweld Bumblebee

(Continued on next page)

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SHOP EQUIPMENT NEWS

(Continued from previous page)

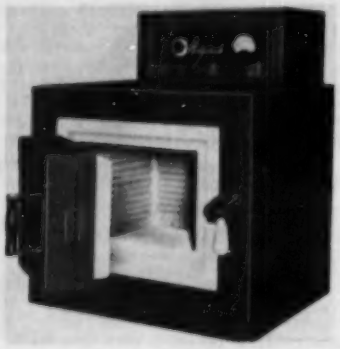
Arcwelder, when a.c. adapting equipment is added.

Additional information may be obtained upon request.

(For Convenience Circle Index Code 0814)

HOTPACK ADDS NEW KILNS

Electric Hotpack Company has introduced to their line a new high temperature kiln, Model No. 7021. The new features of this kiln include: heavy duty one-inch thick high temperature ceramic holders which support



New Hotpack Kiln Model No. 7021

the Kanthal "A" coiled heater elements, to eliminate the possibility of sagging or movement of the wire; seven inches of insulation is provided for by interlocked 2500 degrees F. brick, backed up by additional insulation, besides the element supports; a built-in pyrometer indicates temperature ranges up to 2500 degrees F.; a safety feature is the Hotpack Limitor which turns off the current to the kiln at a predetermined time when preset by the operator. The interior size of the kiln is 10 in. by 9½ in. by 9 in. high, and it operates on 230 volts.

(For Convenience Circle Index Code 0815)

Every Army technological development raises new problems of stockage because of the complexity of modern weapons — the Nike missile system, for instance, has a million and a half pieces. — *Wisconsin Military District Public Information Office.*

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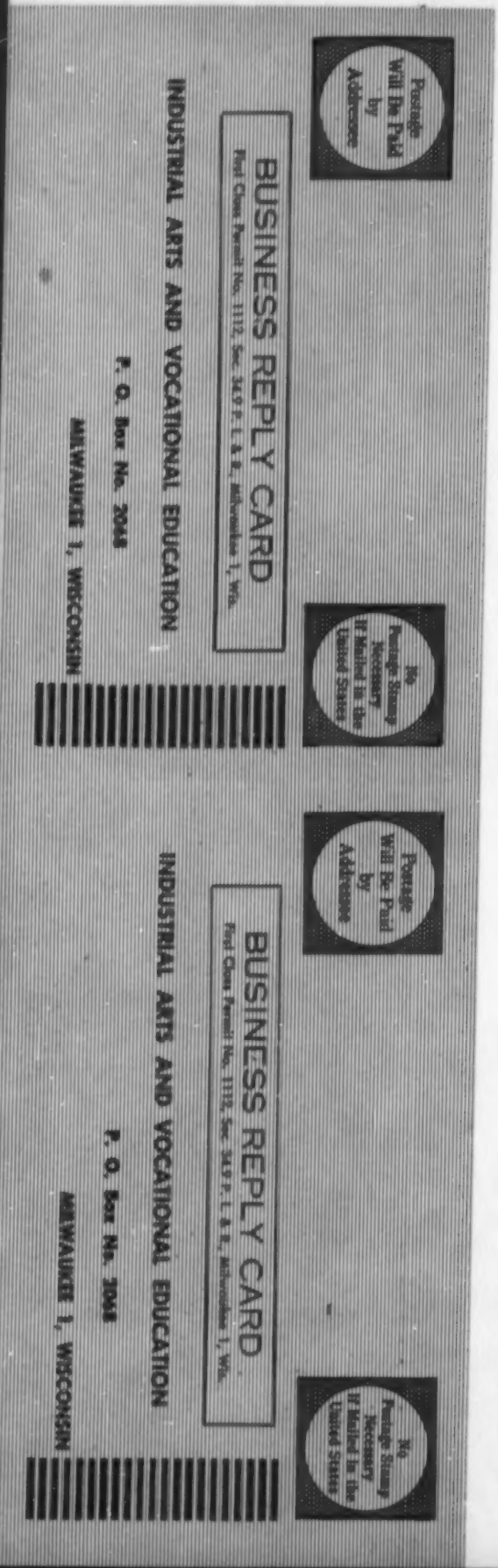
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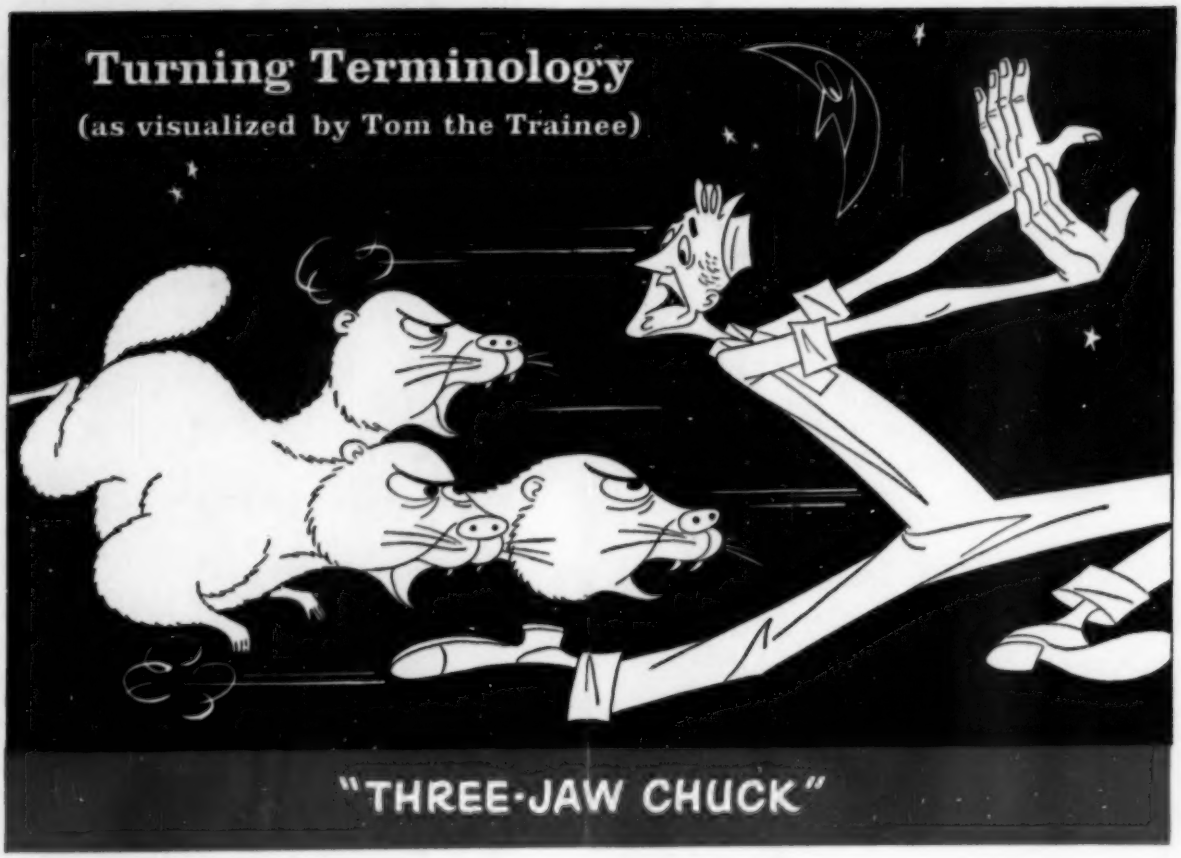

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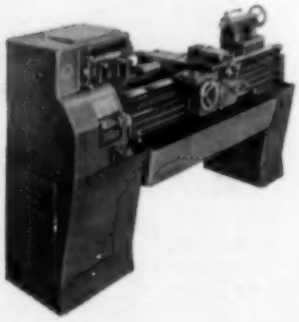

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